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The McGowan Report Issued

THE report of the Committee set up last July by the Minister of Transport, under the chairmanship of Sir Harry McGowan, to review the organisation of the distribution of electricity, is issued to-day. The principal points are briefly stated on page 939 of this issue of the ELECTRICAL REVIEW.

The recommendations of this Committee, while not so drastic or so far-reaching as some had hoped and many had feared, are nevertheless of a character that is likely to lead to strong differences of opinion. In essence they involve the division of the country into regional areas under District Commissioners charged with the duty of preparing schemes involving the absorption of undertakings with individual outputs of less than ten million kWh.

While agreement is regarded as the desirable method, it is held that legislation must confer adequate compulsory powers to be used if necessary.

In so far as dissent may be due to mere parochialism or to a desire to maintain the *status quo* in the face of rapid developments and changing environment, it will secure little sympathy from the electrical industry or from the public at large—Mrs. Partington is always a figure of fun. On the other hand, there are those who, while agreeing that greater centralisation of control produces advantages, have legitimate fears lest these may be more than offset by the damping of initiative and loss of local contact with consumers due to the substantial reduction in the number of undertakings proposed. They argue that the control of generation, the raw material so to speak, is very different in principle from outside control in retail distribution.

Where the Committee's recommendations are in the direction of giving effect to points upon which the general opinion of the industry is agreed (rather in the manner of the British Standards Institution) and in the speeding up of evolutionary processes, they will be readily accepted. Thus the proposal to require all undertakings to offer a two-part tariff for domestic supplies as an optional alternative to a flat rate will, we believe, receive general approval; some would like to see the obligation to quote a flat rate removed altogether. Voltage standardisation is to be left to the unifying tendency that would follow the adoption of the Report.

The power companies have served us so well that the decision to remove some of their disabilities in regard to supply will be welcome. Rural supplies, which were included in the Committee's terms of reference, have not been overlooked, but apart from the benefits to be derived under other sections of the Report we can find little in it that is likely to be particularly helpful in developing more rapidly a class of load that can rarely be self-supporting for many years and is bound to be of slow growth.

We are able to notice here only a few of the salient features of a report that is full of implications—technical, political and social—some of which are a little obscure. No doubt many of these will be substantially altered by criticism from within and without the industry (and it is the duty of the industry to criticise them in a constructive spirit). If they form the subject of a Bill before Parliament, we have no doubt that by the time this has been enacted the present proposals will have been modified in material respects.

Higher Engineering Wages

THE announcement that wages in the engineering industry are to be raised will give pleasure not only to those who will immediately benefit, but also to many people who, like ourselves, were not satisfied that the remuneration for this skilled work was adequate. The engineering industry, in company with the rest of the "heavy" industries of the country, has had to endure very hard times for a number of years, but the latest reports of many concerns show that a substantial improvement has occurred which is not merely transitory. At a meeting of the Engineering Employers' Federation with trade union representatives in April Mr. A. Ramsay, the director of the Federation, said that the desire of the Federation was for peace and goodwill in the industry, as it was

also the unions' desire. It could only be maintained if both sides were reasonably satisfied that justice was being done to them and that the industry was not being asked to assume liabilities which it could not carry and which would ultimately be to the disadvantage of the workpeople themselves. Presumably the Federation considers that the present increase is one which can be borne without disaster, but the men are still dissatisfied, contending that the conditions existing prior to June, 1931, should be restored with a minimum increase of 3d. per hour in the basic rates.

Fulham Power Station

THE new power station at Townmead Road, Fulham, is to be officially opened on September 26th. This station provides a good object-lesson of the forethought required in anticipating load requirements. Earlier completion would have entailed the carrying of capital charges on £2,750,000; as it is, our own calculations show that the 120,000 kW included in the first section will certainly be needed to cope with the load next winter in South-East England. Normally the time taken in the construction of a new station is about four years (extensions to existing stations requiring from two and a half to three years), but conditions are not quite so straightforward in practice as this might imply. Although the consent of the Electricity Commissioners to the erection of the station was given in January, 1931, the starting of the work on site was delayed until September, 1932, as the Fulham Borough Council had to find other accommodation for firms whose land had been acquired for the building. If only the most moderate of the expectations entertained in electrical circles regarding the operating performance of this station are fulfilled, it should have a material effect on the average cost of generation for the grid as well as meeting the demand created by the growth of load.

Knowledge and Intelligence

COMPARED with the physics taught in our youth, modern physical theories plunge us into entirely new and different realms, both of reasoning and reality. Unless we possessed a distinct bent for the subject we were satisfied usually with a more or less general grounding in the fundamental laws enunciated by Boyle, Charles, Avogadro, Gay-Lussac and others, but these would appear no longer to be enough to maintain our *status quo* in the field of modern knowledge. To judge from modern technical treatises, we must now be able to discuss intelligently four-dimensional space, quanta and atomic theory, probability and wave mechanics, while some acquaintance with the theory of relativity is almost a *sine qua non* of polite social intercourse. The elders among us, and those others who have not had opportunities to grasp the true inwardness of all these things, can take comfort from the thought that, while one cannot know too much, provided the knowledge can be assimilated, what really counts is the human ability to make intelligent use of what one has learned, without regarding it as a substitute for the exercise of imagination and initiative.

An Electro-Chemical Survey

THE Chemical Engineering Congress held in London this week provides an apt illustration of the manner in which electricity to an ever-increasing degree affects all branches of applied science. The association between electricity and chemistry has, of course, been close from the earliest days, one of the most promising offspring of the union being the storage battery. Newer developments are, at one end of the scale, the use of electrolysis for preventing the corrosion of and the formation of lime deposits, the result being of electrical interest more indirectly, and, at the other end, the vast potentialities of electro-chemical and electro-metallurgical industries in water-power countries. The only advantage of hydro-electricity, as such, is the low running cost (usually offset for low load factors by high capital charges), which is essential for such processes which provide Japan, for instance, with a load requiring 4,000 million kWh per annum. We in Great Britain have to do what we can mainly with coal, which is likely to be subject to discriminatory charges when used to generate electricity.

Towards Uniformity

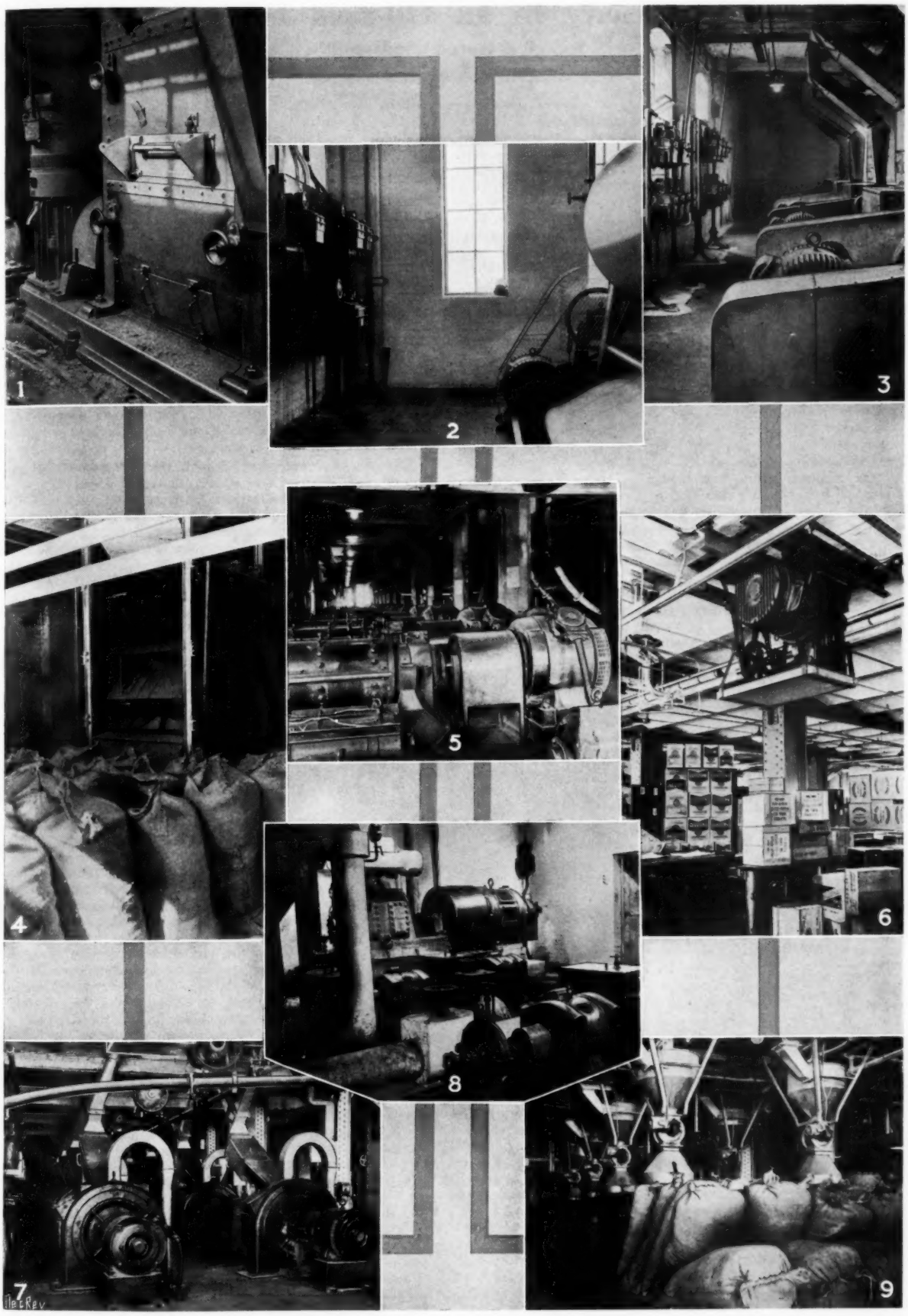
THE need for some sort of standardisation of tariffs (and voltages) has been stressed *ad nauseam*, but although progress has been made the situation remains unsatisfactory. Some recommendations on this important matter are made by the McGowan Committee, whose report, which was published this week, receives some attention on another page. In the meantime, let us commend the practical step taken in the area of the West Midlands Electricity District. The ten supply undertakings in the area have set up a standing conference, whose first decisions are reported in this issue. The system of charging adopted for various classes of consumer is to be uniform throughout the area. This does not mean standard charges, though we may hope that these will be found feasible in the near future. Service charges are abolished where the length of the service does not exceed 40 ft. overhead or 20 ft. underground, and a uniform testing fee is to be charged. The fact that the population of the area is about one million invests this move with no little importance.

Electrically Heated Baths

So pleased are the authorities controlling the Shirehampton public baths with the first year's working of the all-electric heating equipment with automatic control that they have decided to adopt the same system for two further baths now under construction. In a paper read recently before the Southern and South-Western Districts of the Institution of Municipal and County Engineers, Mr. J. Carr stated that the consumption has been less than that estimated and that the annual overall costs with electricity at a flat rate of 0.3d. per kWh (taken at night) of £529 compares with £571 for a similar steam-heated bath, in which "domestic" hot water is not available. The combined capacity of the swimming ponds is 100,000 gals., and the duty includes heating of buildings as well as of water, summer and winter. The Bristol Corporation undertaking is also more than satisfied, as it has agreed to reduce the price to the new baths to 0.275d. per kWh. Cost, however, is not the only factor that has influenced the choice. The obviating of smoke, fuel delivery, and ash removal were additional benefits derived from the scheme.

Cooker Campaigning in Canada

AFTER a year's cooker campaigning by the Hydro-electric Power Commission of Ontario several truths have manifested themselves, states a Canadian contemporary. To us some of them are obvious, such as that electric cookers will not sell themselves, or that where the local system is aggressive more cookers are sold. However, one interesting plan, resembling the "Million More Consumers" campaign of our own development organisation, has been evolved as a result of the deliberations. It is suggested that each municipality should establish a quota of at least 10 per cent. of the number of cookers in use as an objective for the ensuing twelve months, and that it should finance the sales of cookers by dealers for a period of from one to five years, installing a service and cooker wiring at no cost to the consumer. Further, the municipality should provide an advertising fund of $5 per cooker of the quota and embark upon intensive propaganda by displays, handbills, posters and Press advertisements. The Power Commission is also devoting attention to cooker development in the rural areas, and is providing a load-building allowance of $20 on each new cooker, apart from assisting in propaganda aids. A substantially increased cooker load in the province seems certain,



Applications of electricity in a Liverpool oil-seed factory (see following pages)

1. A 32-h.p. vertical geared drive for a rolling mill. 2. Roll end of soap chip drying machine and centralised control for whole unit. 3. Seed breaking machines with 15-h.p. drives; the sequence operated control gear and the feed rolls are shown. 4. One of the large magnets for removing iron from meal. 5. Eighteen 100-h.p. delintering machine drives. 6. Dual chain drives for machines from a common motor. 7. A group of 40-h.p. grinding machine drives. 8. Large motor driven ammonia compressor and circulating pumps for "Trex" chilling equipment. 9. Small geared motors driving grinding plant feed rolls

Electricity in an Oil-seed Factory

Concentrated loads and individual drives

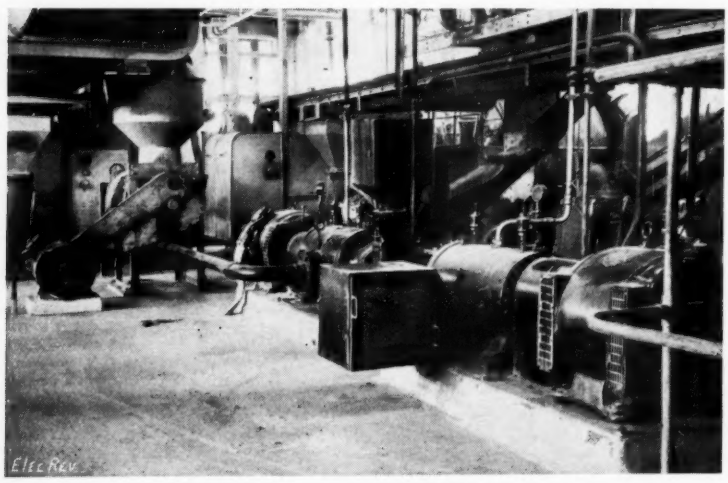
A YEARLY consumption of 25 million kWh; a maximum demand of 6,150 kVA; 1,100 motors connected, representing 11,872 h.p.; a 65 per cent. load-factor; and a power-factor of 96.5 per cent. These impressive figures show how very extensively electricity is used in the Liverpool works of Messrs. J. Bibby & Sons, Ltd., where the major products of oil cakes and vegetable oils are obtained from 11,000 tons of oil seeds per week. Such seeds as cotton, groundnuts, palm kernels, rape and linseed are treated. Products from the oilcakes include compound cakes and meals for all types of animal feeding, and from the vegetable oils are produced crude, refined and edible oils, lard compounds and "Trex," and also various soap products.

The roof sub-station and distribution system were described in our issue of May 8th, and we are indebted to Messrs. Bibby for their assistance in the collection of the following information upon the factory installation and in taking the accompanying photographs.

Seed is received at the works either in large mobile containers or in bags. From the containers the seed is tipped into bins below street level, from which it is bucket-elevator fed to gravity feeding bins at various levels. A 20-h.p. motor, 725 r.p.m., drives this elevator system through worm reduction gear. The bags are fed into the works on band conveyors to sack elevators, which take them to the top and eleventh storey of the oil mill.

On inclined tables with anchoring spikes the sacks are emptied by a shaking operation on to scraper conveyors with 5- and 10-h.p. drives, which deliver the seed to storage bins. It then passes to scraper conveyors prior to delivery to delintering machines which remove the short staple cotton.

A fine example of unit driving is represented by eighteen delintering machines, each with a directly coupled 100-h.p., 725-r.p.m. motor. The next few operations, by virtue of their sequence processing, employ equipment incorporating equally good group driving. Each of a number of units, which crush, cook and press the seed, consists of a feed roll, rolling mill, steam kettle and hydraulic presses, situated on four different floors and driven by a 100-h.p. motor. Hydraulic pressure is provided by 60-h.p. motor-driven pumps. Crude vegetable oil is exuded from the bottom of the presses and the oilcake residue is removed by hand. Some of the seed is crushed separately, and in one case where we saw a 100-h.p. group drive for four sets of rolls, one set of rolls had been equipped experimentally with a vertical motor mounted on a Croft reducing gear. An alternative method of oil production is to pass the cooked seed into a kind of worm compressor, the oil being expelled through slots in the casing.



Blowing equipment for meal delivery to cattle food compound departments

The oils are pumped to storage tanks to await treatment in the refineries, and the cake which is not sold as straight cake is passed to gannows, in which it is broken up. A 60-h.p. motor serves two gannows. Grinding is the next operation, and we saw a group of 40-h.p. drives for machines which operate on the simple meshed-teeth principle. For a finer degree of grinding there are machines in which the driving motors may be considered as an integral part of the process equipment. In each case there are two sets of motors on a common bed-plate, running in opposite directions, and each driving a disc. The material for treatment is passed between the two discs and the clearance is varied by movement of one rotor shaft and disc as a whole by a spring-loaded handle on the free end of the machine. The motors are 50-h.p. units, and each pair is operated by a common starter. For direction changing the line is reversed at the distribution centre by a change-over switch, so that such an important operation as the reversal of a large motor shall not be left to non-electrical operatives. All the feeds to the grinders first pass over or under magnetic separators that are electrically interlocked with the motor-starting apparatus, so that in the event of a motor tripping the feed to the machine is diverted. The magnets have loadings up to 3 kW each, and the current is supplied by motor generators.

For conveying the ground meals to the storage silos there is a continuous gravity bucket system. Four tracks completely encircle the silo building, which measures roughly 200 ft. by 200 ft. Each is driven by a 20-h.p. motor *via* a clutch pulley. The buckets tip the meal into chutes at required points, and the meal is then passed to 9-h.p. geared-motor driven worm conveyors for delivery to the silos. To ensure uniform deliveries from the feeding turn-tables at the bottoms of the silos a finger contact is fitted to each lift door controlling the feed and "slides" on the meal, so that in the event of the meal becoming blocked the finger contact falls and electrically operated visible and audible signals are given at a central indication board.

Efficient communication between the turn-table floor and the grinding machine floor below is given by a signalling system with the four indications start, stop, increase and decrease. When the operator on the grinding floor requires any one of these carried out by the man above he presses a control button corresponding to the particular machine concerned, and then selects the instruction. This is visible on two indication boards, one on each floor. When the operator on the turn-table floor has carried out the instruction he deletes both signals by pressing a push-button.

Five-h.p. motor-driven worm conveyors transport the meal from the silos to blowing equipment for conveyance in an air stream through pipe lines to the mixing departments of the cattle-food factory across the road. For this service a 30-h.p. motor (570 r.p.m.) drives a compressor which delivers air at 7 lb. per sq. in. In the cattle food department there are many unit drives, mostly of 100 h.p. each.

Oil Mill Processes

In the oil mill the pressure-extracted oils are first passed through filter presses for the removal of solids, and then pumped to the oil refiners by means of a battery of six 10-h.p. pumps. Refined oils not sold as such are then pumped to the soap and lard-compound sections. Oil used for "Trex" is first stored in steam-jacketed tanks from which it is fed to the manufacturing units. Each unit consists of milk-type cooler equipment, a chilling roll, a "texturator," in which "condition" is given to the product, a filling machine, and a packing unit of the band-conveyor type. The chilling roll and the feed for the "texturator" have separate chain drives from an 8½-h.p. geared motor suspended from the ceiling below. A 5-h.p. motor drives the "texturator," while the carton-filling equipment is served by a 3½-h.p. motor with variable-speed control, so that the rate of filling can be adjusted. Brine circulated through the chilling roll comes from a refrigerating plant served by an ammonia compressor driven by a 75-h.p. slip ring induction motor, 420 r.p.m.

An interesting multiple-drive equipment in the soap section is a flaking device in which liquid soap is passed over a roll on which it is partly chilled and is then combed off in ribbons and passed through a drying cabinet. A 10-h.p. motor with "Texrope" transmission serves the roll, two 20-h.p. motors on the drying cabinet drive circulating fans and a 5-h.p. motor propels the conveyor system.

A third method of oil extraction is that in which the crushed seed is treated with solvents in special rooms where mining regulations for electrical equipment apply. Flame-proof motors are not employed, for the machines are situated outside the special compartments with their transmission shafts extended through special glands in the walls. These motors can be tripped from inside the room, by mechanical means. An unusual feature of the installation is the adoption of totally enclosed motors for all sizes up to 20 h.p. This is on account of the general oily and sticky conditions prevailing and to avoid the maze of pipe work which would have been required

if the company had decided to install pipe-ventilated equipment in the mill.

Generally speaking, the motors throughout the works are squirrel-cage machines and all above 20 h.p. are controlled by star-delta starters. Motors of up to 20 h.p. are switched direct to line by oil circuit-breakers, the triplicate time lags of which permit starting current without interference with the normal load settings. Where it is necessary for motors to start and stop in sequence interlocking is provided by energising the no-volt coil of a subsequent breaker from the "dead" side of the preceding breaker in order of sequence in operation. Provision is made for isolating the supply from the no-volt coil when this supply is taken from other than its own source.

Examples of such sequence of operation control are the worm conveyors which convey solids from the oil filters, and the seed breaker rolls which operate in conjunction with feed rolls on the floor above. In the former case the worms from a line of filters all feed a common worm conveyor and, in turn, a cross conveyor. The arrangement is such that the controller for the cross conveyor provides master contol for the system.

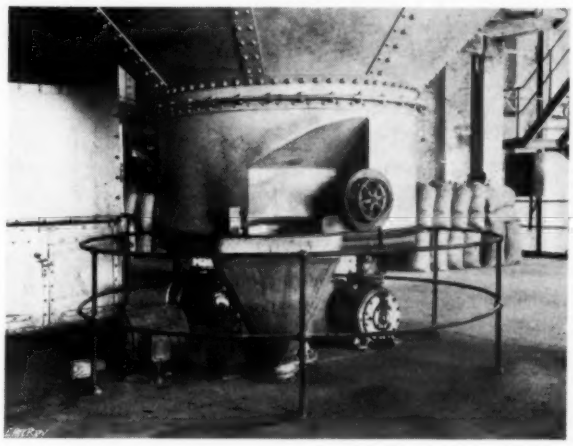
Practically all the motors were supplied by Lancashire Dynamo & Crypto, Ltd., and all the starting equipment by Messrs. George Ellison, Ltd. The high-speed motors driving the refining centrifuges are of British Thomson-Houston manufacture, and Allen West rotor controllers serve the compressor drives.

While careful selection of the motor sizes contributes largely to the high power factor of the system, this is also assisted by eight 250 kVA static condensers located in some of the distribution centres throughout the works.

Steam Supply from Clarence Dock

An interesting feature of the installation is the utilisation of steam from the Clarence Dock power station of the Liverpool Corporation. Steam is supplied through a 7-in. main approximately 2,000 ft. long. The initial steam pressure is 400 lb. per sq. in., and with this pressure it is possible to supply a maximum quantity of 100,000 lb. per hr. through the main, although under the present conditions of operation a maximum of 50,000 lb. of steam per hr. is supplied. The works total steam demand is 80,000 lb. per hr. and the 30,000 lb. per hr. balance is obtained from the combustion of works refuse in Lancashire boilers.

The steam main enters the works at a point where the heaviest loads for the next ten years or so are likely to occur, and the pressure is immediately reduced to 220 lb. per sq. in. through two 4-in. Hopkinson reducing valves operating in parallel, and distribution is then continued at this lower pressure to suitable places for connecting into mains from the works boiler house. At these points the pressure is further reduced to about 120 lb. per sq. in., which is the mean operating pressure of the boiler house. With this arrangement the secondary reducing valves automatically pass steam according to demand and the boiler house capacity to meet the demand. Thus, when there is a plentiful supply of refuse, the boiler pressure can be maintained and the reducing valves remain shut, but if the demand exceeds the capacity of the refuse boilers, the boiler pressure falls with the resultant opening of the reducing valves.



A silo discharge turntable drive

All the reducing valve units include stop valves on either side and one or more safety valves on the low pressure side to relieve excess pressure in the event of the reducing valve not shutting when the load goes off. Control of the supply is maintained by "Electroflo" steam meters and temperature and pressure recorders.

A Power-Energy Meter.

Ascertaining the output of reciprocating engines

By G. T. Garwood, B.Sc., A.M.I.E.E.

THE preparation of competitive multi-part power tariffs when an electric drive is being submitted as an alternative to existing mechanical power generation usually involves the evaluation of (1) the energy output over a representative working period of an engine or engines and (2) the maximum h.p. developed.

With these data the corresponding figures of energy consumption and maximum demand can be approximated, a suitable tariff framed and estimates of demand and consumption submitted to the prospective consumer as a basis for comparing costs.

So far as I am aware no portable and easily applied apparatus is available for measuring the required quantities. As a result, the power sales engineer is commonly faced with a double dilemma. First, if the anticipated demand is not realised the standing charges attributable to the supply may not be fully recovered. Secondly, demand and consumption estimates submitted in connection with comparison costs may, if unduly high, prejudice his case, and if unduly low may later lead to the loss of the customer's confidence and goodwill.

The common indicator is inadequate, since it merely furnishes an indication of the value of one particular ordinate of a curve, of which the *maximum* ordinate and enclosing area are really needed. A proposed basis for the design of a portable and sufficiently accurate power-energy meter is accordingly described below, and it is suggested that such an instrument would be of great value, not only to supply undertakings but also to independent testing authorities and educational institutions.

The energy exerted by the working fluid of a reciprocating heat engine over a cycle is usually represented by the area of the familiar *p-v* diagram, but if the volume swept by the piston is considered as progressive, and if the negative sign is prefixed to the pressures on the return strokes, the *p-v* diagram over a sequence of cycles may be represented as in fig. 1, where the energy exerted is the quantity

$$\int_{v_1}^{v_2} p\,dv \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

and is represented by the sum of the areas horizontally hatched, minus the sum of the areas vertically hatched, within the defined volume limits. The net area within these limits divided by the abscissa value of the volume swept equals the mean height p_m of the diagram, which represents the mean effective pressure.

An instrument in the form of an infinitely variable gear device, in which the displacement of the driver after a given interval is proportional to the volume swept in that interval and the displacement of the "gear-lever" from zero is proportional to the mean effective pressure p_m, would indicate, by the final displacement of the driven member, the energy exerted as defined in expression (1).

The principal difficulty in designing such an instrument consists in deriving a motion (for the "gear-lever") which shall be proportional to the mean effective pressure, for it will be appreciated that this mean pressure is the mean on a volume basis and not on a time basis.

Thus, a given pressure lasting for, say, $\frac{1}{10}$ second, while the crankpin of the engine is passing over the dead-centre position, will not be so effective in doing work as the same pressure for the same time interval when the crank is approximately at right angles to the axis of the cylinder. Some means are therefore required for discounting the cylinder pressures, as it were, in proportion to their inability to produce turning effort on the crank.

The Instrument Described

The instrument shown diagrammatically in fig. 2 appears to fulfil the requirements described. A rigid rectangular frame *a*, consisting of two side bars yoked at their ends and equipped with a pair of damping weights *b*, is pivoted at the point *c*.

Dependent from the yoke spindle *d* at the upper end of the frame *a* is a double shackle link *e*, to the lower end of which is connected (i) the small-end of the eccentric rod *f*, and (ii) the big-end of the connecting rod *g*, the small-end of which is connected to the piston of the pressure cylinder *l*.

A calibrated spring *h*, which is in a state of zero extension

when the frame *a* is vertical, resists any small angular displacement of the frame to an extent approximately proportional to the value of such displacement. The control arm *i* of the ball-disc-cylinder integrator *k* is connected through a magnifying mechanism *j* to the shaft *c* supporting the frame *a*, so that the displacement of the ball on the integrator disc is approximately proportional to the angular displacement of the frame *a* from the vertical. The pressure cylinder *l* is in permanent communication with the cylinder of the main engine, to the shaft of which the eccentric shaft *m* is coupled by a double Hooks-jointed rod or its equivalent. As the piston in the pressure cylinder does not move appreciably, the connecting pipe could be oil-filled. The angular position of the eccentric (regarded as a crank) would at all times coincide with the angular position of the crank of the engine under test.

In an actual instrument the cylinder of the ball-disc-cylinder integrator would be connected to an ordinary meter train, from which the indicated horse-power hours performed during the test period would be obtained by multiplying the advance by constants dependent on the bore and stroke of the engine, and the calibration of the spring *h*. Geared to this meter train would be a clockwork-driven Merz-type maximum-demand (that is, maximum horse-power) indicator.

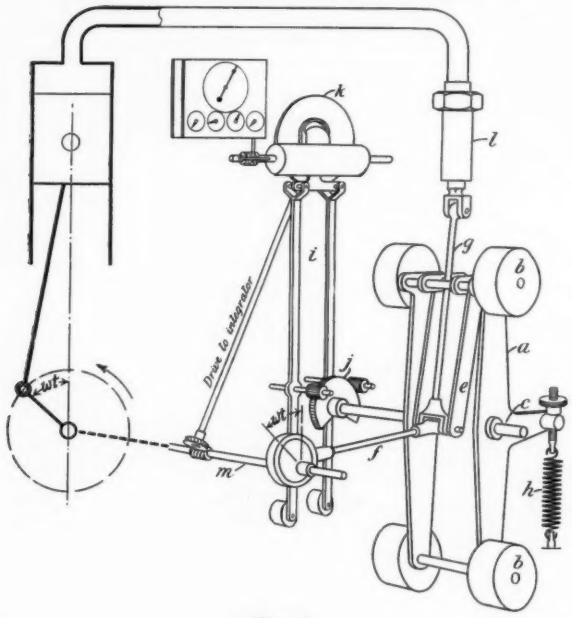


Fig. 2

I will not deal with the mathematical proof of the instrument described, which is fairly simple, but the underlying principles may be briefly mentioned. When the instrument is connected to a working engine the disc of the integrator will slowly revolve at a speed proportional to the engine speed, and the shackle-links *e* will oscillate alternately to the right and left of the axis *c*. While the engine is performing its outward strokes, the pin *o* will lie to the left of the frame axis *c*; and the cylinder pressure communicated to *l*, and thence to the pin *o*, will tend to rotate the frame in a counter-clockwise

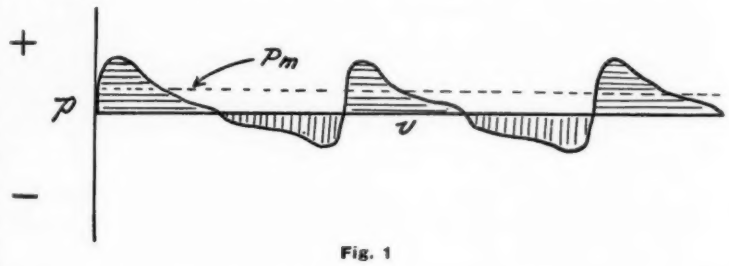


Fig. 1

direction against the action of the spring. Similarly, while the engine is performing its inward strokes, the pin *o* will lie to the right of the axis *c*, and the cylinder pressures will tend to rotate the frame in a clockwise direction. At the instants of dead-centre the pin *o* and the axis *c* will be in line, and any pressures then existing in the engine cylinder will be inoperative in producing any tendency on the part of the frame to rotate, just as they are inoperative in producing any rotational tendency in the main crank.

The effect of the alternating torque applied to the frame *a* of the instrument in conjunction with that of the damping weights *b* will be to cause the main frame to take up an approximately steady displacement from the vertical, the value of which, it can be shown, is proportional to the mean effective pressure in the engine cylinder.

Since, in a given time, the "driver" of the integrator (*i.e.*, the disc *k*) performs a number of revolutions proportional to the volume swept by the engine piston; and since the "gear ratio" as determined by the displacement of the frame *a* is proportional to the mean effective pressure, the total revolutions performed by the integrator cylinder *n* is proportional to MEP × volume swept, which corresponds to expression (1) and to its familiar congener $\frac{\text{PLAN}}{33000}$.

A single-cylinder instrument as described would give reasonable results in connection with a multi-cylinder engine, subject to the instrument being connected to the separate engine cylinders in turn over representative equal portions of the total test period (which might reasonably be a week or more). In such case the final indications of the instrument would require to be multiplied by the number of cylinders in the engine.

For the simultaneous testing of all cylinders of a multi-cylinder engine (including both ends of the single cylinder of a double-acting engine) a corresponding number of pressure cylinders, eccentrics and shackles, each dependent from one main rectangular frame, would be required in the meter; the eccentrics would require to be set at the correct relative angles corresponding to the cranks of the engine.

Earth-atmosphere Electricity Interchange

AN important influence is exercised on the interchange of electricity between the earth and the atmosphere by the "point" discharge which takes place at the ends of conductors, such as trees and tall buildings, whenever the potential gradient near the ground is sufficiently great. Sometimes the process is accompanied by the luminous effect known as St. Elmo's fire.

Continuous records of this peculiar phenomenon have been obtained at Kew Observatory, and an analysis of the results has been published (H.M. Stationery Office, 1s. 6d. net) under the title "Point Discharge in the Electric Field of the Earth," by Dr. F. J. W. Whipple and Mr. F. J. Scrase, as a Meteorological Office Geophysical Memoir No. 68 (Air Ministry, M.O. 356K).

The recording apparatus which is employed at Kew is described in detail and typical records illustrate the effects associated with continuous rain and with thunderstorms. Investigation of the connection between potential gradient and point discharge current has shown that above a critical minimum value of the field the current is roughly proportional to the square of the gradient. Outflow of positive electricity from the recording point exceeded inflow in the ratio of 1.7 to 1. The net outflow amounted to about 60 millicoulombs in a year (a current of 1 mA flowing for two hours would transfer a charge of 7.2 mC). There has been a well-marked diurnal variation in all seasons, the maximum discharge taking place in the afternoon. Sudden field changes caused by lightning flashes showed a preponderance of positive over negative changes in the ratio of 3.5 to 1. In a large number of cases the preliminary field just before a flash was very small (not much greater than the fine weather field) and when the preliminary field was appreciable a reversal of the field was as frequent as a mere reduction. Some speculations on the effect of a space charge blanket on the vertical distribution of field below thunder clouds are put forward by the authors in explanation of the results obtained from the investigations described.

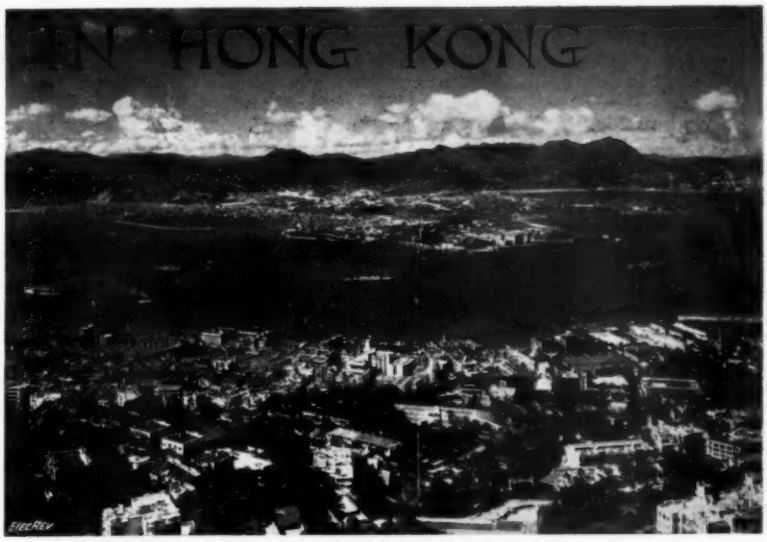
Steel Wire for Signalling

A revision of the Standard Specification for galvanised steel wire for signalling purposes (No. 163) has just been issued. The mechanical requirements and limits in certain instances have been raised. Copies can be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

PROGRESS IN HONG KONG

By C. A. Middleton Smith

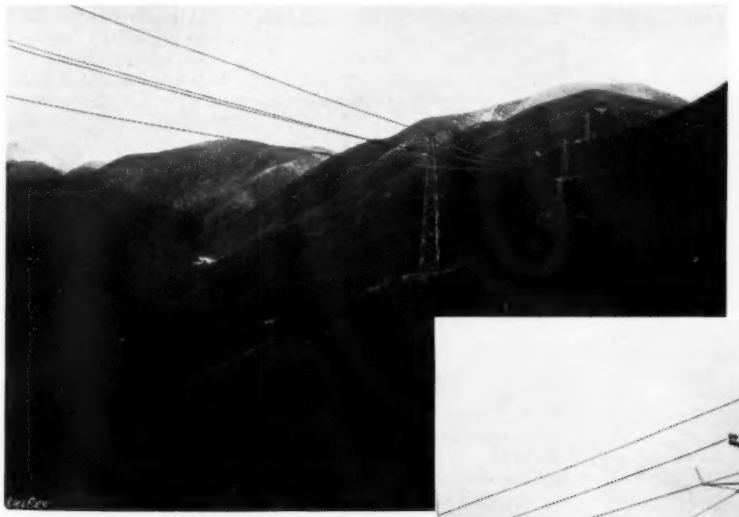
Taikoo Professor of Engineering, Hong Kong University



A view of Victoria, Hong Kong island, with the mainland and harbour of Kowloon in the background

DURING the ninety-five years of its inclusion in the Empire the British Crown Colony of Hong Kong has had a profound effect upon life in the Far East. Because of the many types of engineering work developed there the Chinese have been led to initiate engineering schemes in their own country, and in recent years there has been a great extension of electric power generation in China. In nearly all cases calculations were made for a lighting load only, but in some centres, especially Shanghai, Canton and Tientsin, there has grown up a demand for power. When the Municipal Council of the International Settlement of Shanghai sold the electricity supply system to a company a few years ago for some £10,000,000 it became obvious that there was a big demand for electricity in at least one place in China. The Shanghai Power Co. is now supplying industrial requirements to the extent of over 232,000 h.p. The equivalent kW connected to the system in 1935 was 320,000.

Hong Kong island (part of the Colony is on the mainland) has a population estimated at about 500,000 people. There are only two large industrial undertakings, namely, the Taikoo dockyard and the Taikoo sugar works. At Kowloon, on the mainland, which is more suitable for the development of industries, there are dockyards, a cement works and numerous small Chinese factories. There are two distinct electricity supply companies. That on the island is the Hong Kong Electric Co., Ltd., and that which supplies Kowloon and the new (or leased) territories (on the mainland) is the China Light and Power Co. Messrs. Preece, Cardew and Rider, London, have acted as consulting engineers to both companies. Efforts have been made to bring about an amalgamation of these two concerns, but up to the present without success.



A transmission line across the hills in the "leased" territory, and (right) a typical Chinese village dwelling with distribution line

A few figures concerning the growth in the demand for electricity may be of interest. Not only has there been a very great increase in the demand for electric light in the Colony, but the power load has improved rapidly. On the island of Hong Kong the growth in consumption of electricity, especially among the very small premises, is remarkable. In 1921 7½ million kWh was sold for lighting to about 15,000 consumers, while in 1935 no less than 21 million kWh was sold to about 39,000 consumers. There are over 18,000 consumers whose monthly accounts rarely exceed a few dollars and these are considered most profitable.

The Hong Kong Electric Co., Ltd., was formed in 1889 with a paid up capital of $600,000, while the capital now issued is $6,000,000. In 1916, with a capital of $600,000 (H.K.), consisting of 60,000 fully paid up $10 shares, the company paid a dividend of $2.25 per share (*i.e.*, 22½ per cent.). Its total net working profit for the year was $507,726, of which only $135,000 was used to pay dividends, the balance of $372,726 being used for depreciation and reserve. In 1928 one bonus share was given for every two shares held, making a total capital of $4,500,000, the authorised capital at this time being 600,000 shares of $10 each. The net profit was $2,355,636, of which dividends absorbed $937,000, the remaining $1,398,636 being used for reserve, depreciation, &c. The net profit on working for 1935 was $2,677,578, of which shareholders received $1,350,000, the remainder going to depreciation and reserve. At the end of 1935 the reserves had increased to a total of $6,300,000, so the directors in 1936 capitalised $1,500,000 in the form of bonus shares, making the total capital $6,000,000. The net profit on an issued capital of $4,500,000 was $1,838,542, out of which $1,350,000 was paid to shareholders.

An original shareholder in 1889 of one $10 share has had the opportunity, from time to time, of acquiring new shares at $10, much below the market quotation, and has obtained bonus shares. The result has been that for a total expenditure of $80 he would to-day possess twenty shares, the market value of which to-day totals $1,140 and on which he can be practically certain of an annual revenue of $45, with considerable appreciation in the capital value of the shares.

The company has always followed a policy of caution in

the matter of writing down assets. Thus the value of the plant in the generating station in the last account (1936) was given as about £160,000, which is very low for a total of 39,000 kW, most of which has been installed within the last fifteen years.

In July last year the charges for lighting were reduced, the fall in revenue due to these reductions for a full year being estimated at $220,000. At the present rate of exchange the standard price for lighting is under 2¼d. per kWh.

Since about 1914 the plant has always been kept up to date. Last year $300,000 was spent on capital account. In 1935 the output from the generating station was 48,813,623 kWh, an increase of 5.35 per cent. on the previous year's working. Owing to the trade depression in Hong Kong, resulting in an exodus of labour to China, there has been a serious decline in the lighting load, but a much larger demand for power has been a compensation.

The power station owned by the China Light and Power Co., Ltd., was originally built in Chatham Road, Hunghom, in 1902, the plant capacity at that site ultimately totalling 1,500 kW. In 1920 the station was removed to the present site at Hok-Un on the foreshore at Kowloon Bay, and the plant capacity now totals 19,500 kW. Adjacent to the power station the company has acquired sufficient land to deal with all future developments.

The North Point generating station of the Hong Kong Electric Co., Ltd.

Since 1927 the low-voltage system has been changed from 200/110 V to 350/200 V, and the transmission voltage raised from 2,200 V to 6,600 V. The frequency has also been changed from 60 to 50 cycles in most parts of the supply area, and it is anticipated that the change of frequency will be practically completed during this year.

By arrangement with the Hong Kong Government a 22-kV transmission line has been erected to supply the leased territories. This line was supplied and erected by Messrs. Callender's Cable and Construction Co., Ltd., and is similar in design to the British grid, but is of sufficient strength to withstand winds of typhoon force. Winds of a velocity of 136 m.p.h. have been recorded in Hong Kong during a typhoon. The grid is fed by duplicate 6,600-V underground cables running through the Beacon Hill railway tunnel, at the northern end of which an outdoor sub-station raises the voltage to 22,000. Supply is now available in practically all parts of the leased territories, an area of about 300 square miles. This transmission line was first brought into commission in the year 1930, and the total load on it now exceeds 1,600 kVA.

The illustration on the previous page gives a very good idea of the type of country traversed and the construction of overhead lines in the leased territories. The square lattice towers are those used for the 22,000-V line, and the Painter Bros. (double channel) poles are those used on many of the subsidiary 6,600 V lines. The company has recently decided to purchase another boiler of 100,000 lb. per hr. capacity operating at 400 lb. per sq. in. and 700 deg. F. and a 12,500-kW turbo-alternator. It was expected that the tenders for this new plant would be received at about the end of April last.

Electricity and Comfort

Electricity has enormously increased the amenities of life in the tropics. In Hong Kong there are now many thousands of electric fans which are in constant use in offices and houses from about April until October, when the temperature ranges from about 85 deg. F. to 95 deg. F., and the relative humidity is often over 90 per cent. It is a most depressing climate, and greatly reduces human energy, but the engineer and the doctor are making life in the tropics safer and pleasanter by their researches.

During the last three or four years small plants of the refrigerator type have gradually replaced the old ice box for keeping household food fresh. These machines can be purchased for about £60, and are becoming very popular both in European and Chinese households.

I have often directed attention to the possibilities of using electric power to deal effectively with the great atmospheric bugbear of the tropics—humidity—that enervates and is a danger to health. People who live in temperate regions probably do not realise the effect of humidity upon human efficiency. A temperature of 95 deg. F. with a relative humidity of 50 per cent., as was recorded while I was in Peking, is preferable to a temperature of 80 deg. F. and 98 per cent. relative humidity as is often the case in Hong Kong. Cinemas and offices now use electrically driven freezing plants to condense the moisture in the air. It is only a matter of time and propaganda before these plants will be used in homes, and they will provide a useful load for the supply companies.

Soon after my arrival in Hong Kong in 1912 I criticised the then out-of-date electricity system, which consisted of a single-phase, 75-cycle supply, every fan and motor having to be specially designed. The generating station was badly situated, being on a hill about 300 ft. above sea level, and yet not far from the sea. All supplies of fuel, &c., were carried by coolies. Expert advice was sought, and the whole system was reorganised by London consulting engineers, a new generating station being built on the shore of the harbour. By the enterprise of those who control the H.K. Electric Co., Ltd., the supply system has been reorganised and re-equipped on "all British" lines.

In recent years the directors of the China Light and Power Co., Ltd., have adopted a progressive attitude. They have offered to supply power in bulk to towns outside the Colony, but although this would benefit the probable consumers the negotiations have, as yet, not ended in agreement.

The New China

Very few people in Britain to-day realise the great efforts which the Chinese are making in order to develop engineering schemes in their own country. British newspapers feature reports describing sensational, and often exaggerated, accounts of rumours of wars and banditry in China, but give no space to the extension of electricity supply, the engineering schemes of the Central and Provincial Governments, and the efforts of the large number of Western-educated Chinese to put power behind the worker in China. Since the end of the Great War there has been a remarkable change in the outlook of Chinese officials and business men concerning applied science. Europeans have not hesitated to criticise adversely the hero of Young China, the late Dr. Sun Yat Sen, concerning his political activities. He was, however, the first Chinese leader to advocate, with great energy and enthusiasm, engineering schemes in China. The record of electricity supply in Hong Kong, Shanghai and other places in China proves that such schemes are profitable. We may, therefore, expect considerable development in the near future.

Super-purity Aluminium

The normal purity of aluminium used for conductor purposes is of the order of 99.6 per cent. Greater purities have been used for special purposes, such as electrolytic condensers, but the practical limit obtainable by the ordinary means of production is 98.8 per cent. Within the past few months, however, the British Aluminium Co., has been operating a special process whereby metal of a guaranteed purity of 99.99 per cent. is obtained. The cost of manufacture of this super-purity metal is too high to permit of its general use for conductors, but for condenser purposes depending upon the formation of an anodic film the minimisation of the impurities would lead both to improved performance and longer life. It is probable that other applications for this metal will be found. Its electrical conductivity, for example, is of the order of 64 per cent. as compared with 60 per cent. for metal of normal purity. It is much softer and more ductile, but its outstanding property is its much higher resistance to corrosion. The metal is available in all normal forms, ingot, strip, wire, &c.

Radio Relay Equipment. By G. S. Lucas and E. S. Hall

Some of the limiting features of design

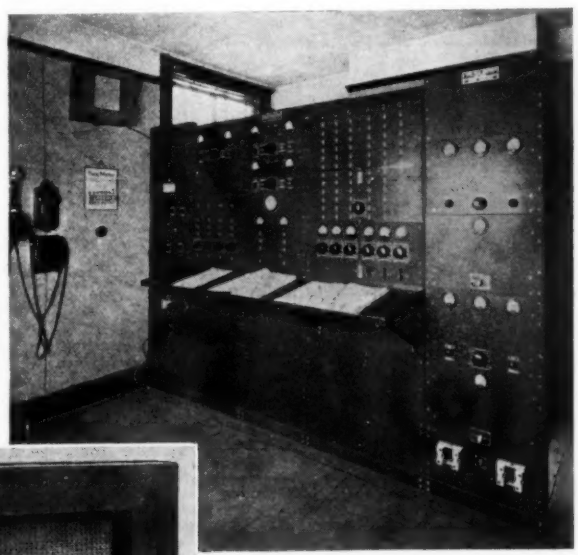
THE size and layout of the central distributing station of a broadcast radio relay system are governed by the network of distributing circuits carrying the speech current to the loud speakers of individual subscribers. The receiving station is placed at the centre of gravity of the speaker load, whence the speech distributing circuits radiate in the form of insulated cables carried on porcelain insulators in a similar way to telephone wires.

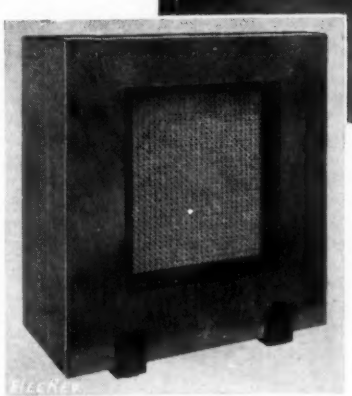
The attenuation, or loss of voltage along the line, is minimised by making the line resistance small and keeping the equivalent resistance of the speakers as high as possible. Thus is audible change in volume prevented at the end of a long line as speakers are switched on and off the line, so avoiding the necessity for listeners to be constantly adjusting volume.

It is desirable to limit the attenuation at the end of the line to between 4 and 6 decibels; a sudden change of 2 db is just audible to a careful listener, whereas a change of 4 db is perceptible when the load is varying gradually.

Actually frequency attenuation takes place as well as a decrease in output, and this form of distortion becomes more apparent as the length of line and loading increase. Nevertheless, by carefully choosing the speaker and its appropriate transformer, and by limiting the length of the trunk lines to between 2,000 and 3,000 yards, it is possible to feed from 200 to 300 speakers from a single line without serious attenuation or frequency distortion.

A station designed on these principles will feed an area of approximately one mile radius. When a larger area is to be covered it is preferable that it should be divided, with the main station at the centre of the heaviest load and sub-stations at the sub-centres. Each sub-station is fed from the main station by telephone lines and is equipped with power amplifiers which may be manually operated by a local attendant or automatically controlled from the main station.





Equipment providing for 300 subscribers. (Inset) The loudspeaker employed on the Rugby system

Output Compensation

In addition to the lines, the output voltage of the amplifier itself does not remain constant at all loads. Its impedance must be carefully maintained and matched, since on a fully loaded line there may be a difference of from 4 to 6 db in the volume level between speakers at the beginning and end of a long line, and this difference may be increased to 8 or 9 db if no load compensating circuit is provided.

The chief difficulty in providing compensation is to obtain an indication of the number of speakers connected to the line at any instant. For this there is a B.T.H. circuit (fig. 1), which is patented, for injecting a d.c. voltage into the line and measuring the current. The d.c. resistance of the speaker transformer is too low to give a reliable indication, because on heavily loaded lines the resistance of the line may be higher than the combined resistance of the transformers. A high resistance (R_3) is, therefore, connected in series with each speaker transformer shunted by a condenser (C_3) to by-pass the audio-frequency signal. The current in the line is measured by an ammeter and kept constant by adjusting a variable resistance (R_2). The value of resistance necessary to maintain constant current in the line is directly dependent upon the number of speakers connected, and the rheostat dial can be marked "number of speakers" or "number of subscribers." Mechanically coupled to the resistance (R_2) is a variable arm of impedance (Z) which compensates for changes in audio-frequency load on the line.

When the resistance R_2 is numerically equal to the equivalent load impedance of the speakers (fig. 16) the compensation impedance is a resistance (R_1) which can be used for the double purpose of controlling d.c. current and balancing a.c. load.

The overall impedance characteristic of the speaker and its associated transformer, in ohms, is usually determined at a given frequency, but is no indication of the combined value at other frequencies. It should be nowhere less than the impedance for which the distribution system is designed, or serious attenuation and frequency distortion may result. The effect may not be immediately apparent, as the aural result will depend very largely upon the quality of the speaker, but may be experienced when some users demand better quality speakers, while others retain their earlier models. Once incorrectly matched speakers are installed it may be found difficult to remove them from the lines.

Volume Range and Expansion

Another factor which limits reproduction is the volume range transmitted or recorded. Although seldom referred to, and often entirely ignored, this factor is as vital to good-quality reproduction as the frequency range. A full orchestra has a volume range of approximately 70 db; that is to say, the ratio of the energy of the softest note of a single instrument to the loudest blast of the full orchestra is 1 to 10,000,000. For orchestra rendering the minimum is less than for a single instrument because of the distribution of the instruments.

Owing to limitation of broadcast transmission, the maximum volume range that can be radiated is approximately 30 db, or an energy ratio of only 1,000 to 1. This range is sufficient for the reproduction of controlled speech and single instruments, but is quite inadequate for even a small orchestra. With the limited volume range available in the broadcasting system it is necessary to effect a compromise by manipulating the volume control until the whole volume range is compressed into the limits of 30 db.

This restriction is not confined to broadcast reception, but is present in all forms of sound reproduction. With gramophone records, also approximately 30 db, the limitation lies in the spacing of the grooves of the sound record, which determines the maximum signal that can be recorded, and the record scratch which limits the minimum signal that can be heard. In sound film work the range is increased to between 40 and 45 db, the upper limit being set by the maximum amplitude of signal that can be recorded in the space available for the sound track and the minimum by the background noise from the film.

The volume range can be increased automatically by so arranging the amplifier circuit that audio-frequency signals of low intensity are amplified in the ordinary way, but, as the intensity increases, the magnification factor of the amplifier grows and the loud notes are over-emphasised. The action is as though the manually operated volume control on the receiver were turned up for the loud notes and down for the soft notes, the position of the volume control being determined by the sound intensity of the note itself. This is exactly the reverse of what happens in the control room of the broadcasting studio.

The volume expansion circuit, therefore, compensates very appreciably for the restriction of volume range inherent in a system. The aural result with musical programmes is very marked, increasing the brightness and expression. No improvement is obtained with speech, and care must be exercised in its use for distant station reception when fading is apparent. This feature is a very definite asset and has been introduced into B.T.H. design as a standard component to anticipate future demands. Some increase in the power amplifier output is necessary with volume expansion, because the ratio of maximum to average signal is increased. In its simplest form (fig. 2) the audio-frequency signal is fed into

the first valve (V_1) and amplified and rectified. The rectified d.c. signal controls the bias on the variable-mu valve (V_2) in such a manner that the amplification increases with increase of rectified signal. In its practical form on the intermediate amplifier tray, provision is made for controlling the degree of expansion by varying the bias resistance (R), or by cutting it out of circuit entirely by a switch (S). A meter is provided in the rectifier circuit to indicate the range of control at each setting of resistance (R).

A Midland Installation

The equipment designed and built for Midland Radio Relay Services, Ltd., by the British Thomson-Houston Co., Ltd., has been constructed on the "unit" principle in rack-and-

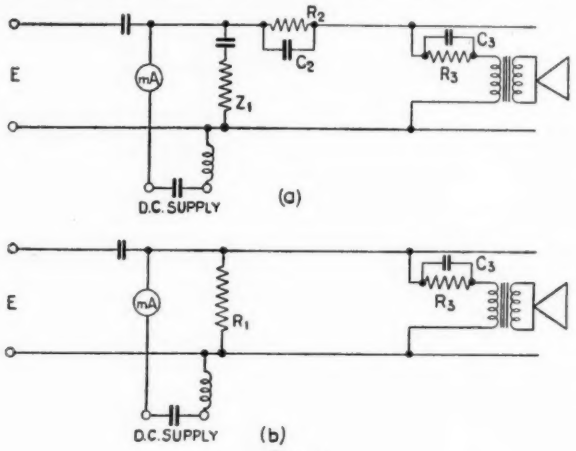


Fig. 1

panel form. The power amplifiers are each capable of feeding a fully loaded line of 200 to 300 speakers. On light loads and while the station is expanding, several lines may be paralleled into one amplifier, but under no circumstances is it necessary to resort to the paralleling of power amplifier outputs.

The unit system is economical in that the total power rating of the amplifiers is never greatly in excess of that required for a single programme. For instance, a station with a total of 2,000 subscribers, allowing 200 speakers to each power amplifier, would require only twelve or thirteen power units for two completely independent programmes. With the alternative system of large-power units capable of supplying all subscribers' lines from a single amplifier a two-programme service would require exactly twice the capacity.

Also, complete standby is provided by a single power amplifier, while a large capacity amplifier would be necessary with the alternative method. In a similar manner, two local and two long-range receivers, each self-contained with its own rectifier, provide complete standby for two local programmes or one local and one long-range programme.

The equipment illustrated is suitable for 300 subscribers, but can be augmented by additional amplifiers to suit 1,000 or more. It comprises four radio receivers with their aerial equipment; a short wave receiver; three intermediate amplifiers; two power amplifiers; and a control board with switches for the various amplifiers and output lines, and a line insulation testing panel. Each amplifier is complete with its own mains rectifier and the receivers are mounted on a separate rack so that they can be located separately from the main equipment if necessary for good reception.

The Aerial System

For the installation at Rugby it has been possible to use two vertical aerials 20 to 30 ft. in length for local reception, while for long-distance work a horizontal aerial 100 ft. long and approximately 50 ft. high is used. For the other long-distance aerial and for use on short wave reception a special V doublet aerial has been installed.

With a two-programme system, only two receivers are in use at any time, but the others are available as standby and can also be used for changing and mixing programmes. The local station receiver comprises a single h.f. stage, followed by a duo-diode detector valve, resistance capacity coupled to the output stage. The long distance receiver is a superheterodyne, a single stage of band pass signal frequency tuning being followed by the oscillator, the first detector and two intermediate frequency amplifying stages. The final valve is the second detector, and the circuit for providing amplified delayed automatic volume control is incorporated in this stage. Each receiver is complete with mains rectifier and has an output suitable for connection to a G.P.O. telephone line, so that they can be separated from the main station if necessary.

An input control panel with a bank of selector switches enables any receiver to be connected to any intermediate amplifier through mixing potentiometers. Monitoring jacks provide for tuning and volume control before connection is made to the intermediate amplifier. The mixing controls on the input control board are not primarily provided for volume control, but for fading and mixing. They should normally be operated at their full open position, the volume being adjusted on the intermediate amplifier controls. This arrangement provides a mixing control independent of the volume control and prevents the possibility of overshooting the correct setting, which occurs if fading and mixing is done on the main control.

The input and output lines of the control panel are matched to an impedance of 600 ohms and are suitable for connection to Post Office telephone lines, as are also the intermediate amplifiers for cases in which the receivers have to be remotely situated from the main station. They will feed up to six power amplifiers and include a volume expansion circuit with control for regulating the amount of expansion. The circuit uses two Type AC/VP1 valves as the volume expanders, one Type AC/2HL valve as the biasing-back valve, one Type AC/P output valve, and one Type UU120/500 rectifier valve. The input and output connections are through transformers.

Meters are provided for checking the anode currents of the valves, together with a mains voltmeter and volume control of the stud type calibrated in decibels.

The output of the amplifier is fed to the intermediate control panel which has isolating switches, monitoring jacks and output voltage indicators. The switches permit of any intermediate amplifier being switched on to the programme selector switches on the output control board. With the power amplifier load maintained constant, by means of the load compensating device, the input voltage to the amplifier should be independent of the load.

Power Amplifiers

The power amplifiers (rectifier and amplifier) are mounted one above the other on the rack and have a common cover which is interlocked, so that if removed the supply to the rectifier is automatically disconnected. The amplifier gives a maximum output of 120 W for 5 per cent. total harmonic distortion, and consists of two Type TV845C valves operating in Class AB amplification. The steady power consumption from the mains is only 500 W.

The input to the amplifier is suitable for connecting to a 600-ohm line, and the circuit consists of one amplifier stage feeding two Type PP5/400 valves in push-pull, which drive the two Type TV845C power valves. The rectifier consists of two Type U150/1,100 valves operating as a full-wave rectifier, and a separate Type UU120/500 rectifier for the driver valves.

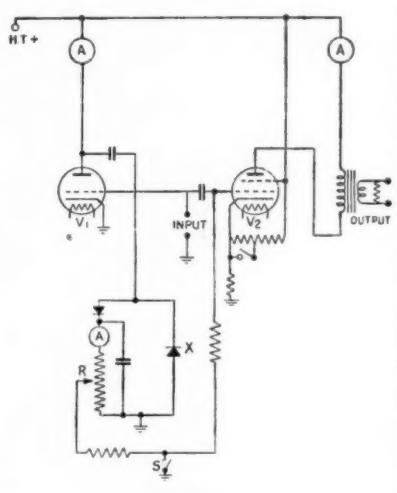


Fig. 2

From the power amplifiers the signal passes to the output control panel which carries the speaker load compensating circuit and indicating device; the line distribution board, consisting of switching circuits, whereby any power amplifier can be connected to any outgoing line, or any number of lines paralleled on to a single amplifier; programme selector switches by means of which the input of any amplifier can be connected to either programme; a line testing panel for testing the insulation of each line to earth, or alternatively between pairs of lines; and a monitor selector switch for monitoring the signals on each of the outgoing lines.

The speaker finally chosen has a permanent magnet with an 8-in. cone. The magnet is of nickel aluminium with a high flux density, and the impedance is matched by a transformer to 12,000 ohms. Mounted in the speaker cabinet, in series with the primary of the transformer, is a resistance and short-circuiting condenser for the load measuring device. The overall frequency response obtained from the amplifier is flat within ±3 db between the limits of 50 and 8,000 cycles.

The Distribution Report

McGowan Committee's Recommendations

THE Report of the Committee on Electricity Distribution appointed by the Minister of Transport (Mr. L. Hore-Belisha) last July is being issued to-day (Stationery Office, 2s.). This Committee consisted of Sir Harry McGowan, as chairman, Sir John Snell (chairman, Electricity Commissioners), and Mr. J. Morison. The Report is a document of 88 pages, with two appendices and several graphs.

The Committee believes that an improved organisation of the electricity supply industry would follow the adoption of its reasoned recommendations. The essential features of any scheme of reorganisation must be:—

(*a*) A substantial reduction in the present number of undertakings;

(*b*) The prevention of the splitting up of comprehensive undertakings through the exercise of rights of purchase by local authorities;

(*c*) Elimination of duplicate powers in the same area.

Adequate grounds do not exist for an immediate reorganisation on a regional basis by the setting up of regional boards which would buy out existing undertakings. Reorganisation should be based on the absorption by the larger and more efficient undertakings of the smaller or less efficient ones.

Any attempt to carry through a scheme of reorganisation on a voluntary basis is bound to fail, but such schemes should provide for the possibility of ultimate public ownership of all undertakings, including those not at present subject to purchase.

No undertakings should be transferred compulsorily without a prior local investigation. The Electricity Commissioners should delimit the country into a number of areas and appoint for each area a temporary District Commissioner, who would prepare and submit to the Electricity Commissioners a scheme of reorganisation. Advisory committees comprising representatives of the undertakings in each area should be appointed to assist the District Commissioner in a consultative capacity.

When the Electricity Commissioners have published a scheme and considered any representations, it should become operative where (*a*) the scheme is agreed to by the undertakers concerned, or (*b*) the output of any undertaking to be acquired compulsorily did not exceed 10 million kWh in the year ending March 31st, 1936.

Otherwise a scheme when approved by the Electricity Commissioners should not become operative unless confirmed by the Minister of Transport and approved by Parliament.

Power companies will usually be retained, but should be consolidated on a basis which should include (*a*) amalgamation of the distribution undertakings, whether held by the power company or by subsidiary companies, with the non-purchasable Power Act undertaking; (*b*) suspension of local authority rights of purchase; (*c*) transfer to the power companies of small undertakings in or adjacent to their areas.

Public Acquisition of Power Companies

At the end of a period not exceeding fifty years, the consolidated power undertaking should be liable to purchase by a public authority on the basis of capital expenditure less depreciation. Such a power company should be subject to financial control, to include: (*a*) a sliding scale relating prices to profits; (*b*) approval by the Electricity Commissioners of the terms of issue of new capital; (*c*) more effective control by the Minister of Transport in regard to methods of charge.

Distribution companies should be on a consolidated basis subject to financial control and ultimate purchase similar to that for power companies. The period for the consolidated tenure should not exceed fifty years and would depend on the present unexpired franchise. A consolidated undertaking should standardise tariffs as soon as possible. The basis of purchase of local authority undertakings should be cost less depreciation. Acquisition of company undertakings should be on the basis of the fair value of the assets with compensation for loss of future profits.

The Electricity Commissioners should be empowered to require undertakings (*a*) to carry out schemes of extensions for undeveloped areas, and (*b*) to offer facilities for the hire or hire-purchase of apparatus and assisted wiring, and also to effect minor boundary adjustments of area as between two adjacent undertakings.

The London and Home Counties Electricity District may appropriately form a delimited area. The large number of undertakings in this area, some with duplication of powers, the differing systems and tariffs, and the inequality in the facilities offered, justify criticism on the part of the public.

No variation of the principles of the London Electricity Acts, 1925, should be contemplated, except as may be consequential to physical amalgamation. The present constitution of the Joint Electricity Authority should be brought under review.

The advantages offered by the holding company system in regard to central management, central purchasing, and the provision of adequate financial resources have in certain cases been achieved, but sometimes the benefits of amalgamation are not passed on to the operating subsidiary companies.

The Electricity Commissioners should be empowered to require the amalgamation of subsidiary companies with one another and with the holding company.

The accounts of a holding company should be subject to official audit, and at any inquiry into the maximum prices of a subsidiary company, profits made by a holding company should be taken into account.

Complete standardisation of systems is not immediately practicable without either some form of Government assistance or a general levy on the supply industry, neither of which is justified. The reorganisation recommended should facilitate and expedite standardisation, which is already being carried out voluntarily by certain undertakers. A scheme should provide for standardisation within the area of a consolidated undertaking and within a prescribed period.

Amalgamation of undertakings into a smaller number of larger undertakings will be an important step towards standardisation of methods of charge.

The Minister of Transport should be empowered to require all undertakers to offer an approved statutory two-part tariff for domestic supplies as an optional alternative to a flat-rate charge. The fixed charge should normally be based on floor area or on rateable value. The actual scale of fixed charges under the two-part tariff should be published.

Flexibility in quoting special rates for special classes of supply must be allowed.

Schemes should provide for the laying of distribution mains of adequate capacity within a prescribed period in built-up streets in urban areas. The creation of a demand in small-class property should be encouraged by the offer of facilities for hire- and hire-purchase of apparatus and assisted wiring and by a more extensive use of two-part tariff prepayment meters. Supply authorities should be empowered to carry their cables under the eaves of houses.

Development of Rural Areas

Development of rural areas has been made more difficult by prior and independent development of urban areas. Rural areas should, as far as possible, be grouped with urban areas. As a result of such reorganisation considerable further development of rural areas should be possible. No form of Government subsidy is recommended.

The Electricity Commissioners should be empowered to prescribe a lower guarantee of revenue than 20 per cent. on the capital expenditure involved. Where a capital contribution is required in connection with a supply to isolated premises the consumer should be entitled to a proportionate refund if other consumers are supplied through the same main within a period of three years.

Local authorities might be empowered to participate in a guarantee in connection with the supply to villages in their district. The Minister of Transport should be empowered when granting compulsory wayleaves to fix the wayleave rentals and compensation.

Where gas and electricity undertakings are left under the joint ownership of a local authority, more rapid development of the electricity undertaking would follow if the authority were required to have separate committees.

A local authority should not be entitled to restrict the right of any owner or occupier of premises to take a supply of electricity; the services of gas and electricity should be given equal facilities.

A non-statutory body should not be allowed to supply electricity to new consumers within the area of supply of an authorised undertaking without its consent, subject to a right of appeal to the Electricity Commissioners.

Authorised undertakers should be entitled, with the consent of the Electricity Commissioners, to acquire the mains and other apparatus used by non-statutory bodies for supplying consumers, on the basis of capital expenditure, less depreciation, provided that no undue hardship would fall on the consumer.

A more uniform method of assessment should be applied to all electricity undertakings.

While there may be some disturbance of employment in the initial stages of reorganisation, the subsequent expansion of the industry should result in increased employment, and legislative provision should be made for the payment of adequate compensation to those whose position may be worsened.

Advantages of the Trolley Bus

Transport managers' opinions

AS we have already reported, one of the papers read at the recent annual congress of the Tramways, Light Railways and Transport Association was on "Some Aspects of Trolley Bus Development." In the course of this the author, MR. A. T. PRIDDLE, of the Associated Equipment Co., Ltd., said that foremost among the many departures in the modern trolley-bus three-axle chassis was that the motor was amidships, resulting in a single short transmission shaft eliminating the acute angle previously existing, which, in earlier examples, gave a certain amount of trouble. The motor had been removed to an unobtrusive position under the floor and the control equipment could be mounted on the chassis, permitting the whole of the floor space to be available for fare-paying passengers. The disposition of the units around the chassis allowed a large crew to effect the servicing in a short time.

Discussing regeneration or field-regulated control, he pointed out that the former scheme undoubtedly held first place in the majority of orders placed in the last two years, though there were definite limitations to it. A comparison between the two systems made a little while ago with similar vehicles on similar routes, moderately fast suburban service and flat roads, showed consistently over a period of several weeks a consumption of 1.9 kWh per car-mile with regulated field equipment and 1.87 kWh with regeneration equipment. The latest available equipments were fitted in each instance. Possibly under different conditions better results would be obtained. In its capacity as a brake which was entirely independent of speed and the rate at which the driver applied the brake, the compound-wound motor scored over the regulated type.

Modern distribution schemes for trolley-bus systems favoured high-voltage feeders supplying rectifier sub-stations situated at frequent intervals en route permitting short d.c. feeders, thus minimising network losses. Reversed currents could not be returned to the high-voltage supply, and one was dependent upon the interchange of current with other buses to absorb the regenerated current.

Automatic control with fixed acceleration rates was common in America, but in this country it was generally considered that the complication and expense were not justified.

Three methods were available for suppressing radio interference, *viz.*, stopper coils of the double-wave type, fitted on the roof and connected in series with the main trolley feeds; filters; and condensers connected to the overhead line at intervals of from 80 to 240 yards. The last method, with simplified chokes on the trolley bus, might form the most satisfactory method in the future.

High versus Low-voltage Lighting

It was difficult to see the justification for the Ministry of Transport's insistence on low-voltage lighting for vehicles with all-metal bodies, and its approval of high-voltage lighting for composite bodies, in which the exterior panelling was bonded together by metal mouldings, flitches and gusset plates.

A recent method of tackling the lighting problem involved the use of a 1,600-W generator attached to the main traction motor, designed to cut in at approximately 4 m.p.h. and developing full output at 5 m.p.h. This machine had several advantages. The most attractive scheme was undoubtedly long series mains lighting, circuits of 15 40-V 40-W lamps with fusible cut-outs in the lamp caps to short-circuit any lamp that failed, together with a small battery and a dynamo direct driven from the traction motor. The advantages of the high-voltage system were summarised as unlimited lighting, cheapness and simplicity, reliability, low weight, low maintenance and freedom from noise. On the other hand, the low-voltage system offered excellent regulation and freedom from "black-outs" in the event of power-supply failure.

The mobility of the trolley bus had been improved considerably by the addition of a further battery group to the low-voltage lighting set, together with a suitable switch.

After discussing various types of trolley buses, the author concluded with the statement that light weight and simplicity should be the keynote of future development. The trolley bus had many advantages, but the tendency to burden it with countless "gadgets and frills" was to be deprecated.

Discussion

Opening the discussion, Mr. W. MARSH (engineer and manager, Brighton Corporation Tramways) said that it seemed uneconomical to carry an extra quarter of a ton in case it might be wanted once or twice a week. The taxation on a trolley bus was about one-third that of the other buses, and sooner or later the discrepancy was likely to be narrowed down, most probably by raising the tax on trolley buses.

MR. S. J. PATMORE (G.E.C.) considered that the advantages of high-voltage lighting were very much greater than those of the low-voltage battery system. He hoped that designers would endeavour to produce machines with outputs in the neighbourhood of 2, 3 or 4 kW to enable adequate lighting to be provided. Mr. A. W. REED (C.A.V. Bosch, Ltd.) thought that the generator direct-driven off the motor might affect chassis design. He suggested that it might be better to fit a belt-driven generator which did not interfere with the main function of the motor. The high- and low-voltage systems would then be kept definitely apart.

Mr. W. VANE MORLAND (general manager, Leeds City Transport) suggested that, although regeneration might be all right on some systems, it assumed an entirely new aspect on others where there were long successions of heavy gradients. One could not always ensure that there was an outlet for the regenerated current, so that one had to rely on the over-voltage relay. If transport authorities were invited to embark on large capital expenditure on trolley-bus routes, they should be assured that there would not be an increase of taxation within the near future.

Chassis- and Cab-mounted Equipment

Mr. A. E. GRIMSDALE (Metropolitan-Vickers Electrical Co.) suggested that, for the sake of two seats of doubtful value alongside the driver, the chassis-mounted equipment introduced a number of disadvantages. There was little difficulty in maintaining the electrical equipment in the cab. He suggested that the advantages of the electric brake were that it was rapid in action and yet had a positive limit to its maximum value; it gave freedom from skidding; the maintenance cost of the electrical apparatus was negligible.

Col. A. H. L. MOUNT (Ministry of Transport) said that the Ministry would like to see low-voltage lighting on all types of bodies, and he was glad to note that that policy was adopted by some operators; and in view of the advantage of emergency battery traction, he could not help thinking it was bound to increase. With regard to the criticism that a different procedure was adopted by the Ministry in respect of trolley buses from that applied to public service oil and petrol vehicles, it must be borne in mind that Parliament had laid down the procedure adopted and that the Ministry was carrying out that procedure. Any improvements in administration procedure that were urged by operators would receive very careful consideration.

Alderman Sir WILLIAM DAVY (deputy chairman, Manchester Corporation Transport Committee) said that it should be brought very seriously to the attention of the Government that the transport undertakings could not assist as they would like to do in carrying people to and from the big estates in the outlying parts of our cities if so much additional taxation was to be piled on to them. Mr. W. V. EDWARDS (general manager and engineer, Hastings Tramways Co.) said the author of the paper did not seem to be very keen on regeneration, but on the hills in Hastings he could get back 120 or 130 A steadily. For over 3½ years he had been running an emergency sub-station without any protective gear at all; one section of the line was fed by mercury-arc rectifiers and the same section was also fed by the power house, so that excess current and overloading troubles were avoided. With regard to distribution, he said that whereas normally each sub-station fed an isolated section of the line, he had provided a connection between one area fed by one sub-station and adjacent areas. Mr. H. P. ASTBURY (C.A.V. Bosch, Ltd.) said that the motor-generator cut out all difficulties in the way of fog and the various other factors which might hold up the transport of a city.

The Voltage-relay Question

Mr. C. OWEN SILVERS (general manager, Wolverhampton Corporation Transport Department), discussing regeneration, said he had not adopted any voltage relay on the vehicle itself, but probably that could be done in the sub-stations. Regeneration was well worth while if the difficulties in dealing with the current supply could be overcome; these had been made greater by the introduction of the mercury-arc sub-stations.

The CHAIRMAN (Mr. T. E. Thomas) said that where, as in London, it was almost a necessity to have a battery for turning purposes, it was an advantage to have one battery to do the double job, and he was not at all worried about having to use low-voltage lighting.

Mr. PRIDDLE, replying to the discussion, said the additional weight of battery for turning purposes was only between 150 and 170 lb. The 3-kW output for which Mr. Patmore had asked for generators rather put weight-saving out of court. Regeneration had a very definite value, particularly with

The Chemical Engineering Congress

Discussions of electrical interest

SEVERAL papers of electrical interest have been submitted at the Chemical Engineering Congress of the World Power Conference in London (June 22nd-27th).

In one of these the author, Mr. A. Skelton, points out that the availability of cheap hydro-electric power in Canada has induced large electro-chemical and electro-metallurgical industries to grow up. They are, however, largely dependent upon export trade, and consequently Canada is vitally interested in such restrictive measures as tariff barriers, strategic considerations and cartel arrangements. Prof. G. S. Whitby and Mr. F. G. Green also survey conditions in Canada and give an account of the progress made in the design and operation of power plant, including the automatically-controlled electric boiler, which has made it possible to pursue many industries in densely populated areas far removed from local coal supplies. Mention is made of the development of the metallurgical industries rendered possible by the hydro-electric plants on the Columbia river. A synthetic ammonia plant is another component of this organisation, the hydrogen being obtained by the electrolysis of water; and acetylene from calcium carbide now forms the basis of a series of important synthetic organic products. The silicon iron and nickel chrome steels used so extensively in these operations are now manufactured by the metallurgical industry of Canada.

Water and Fuel Treatment

Among a group of papers dealing with the treatment and disposal of liquid and gaseous effluents, that by Messrs. W. A. Damon and B. Wylam explains relevant legal enactments in Great Britain. The toxicities of many gases and vapours are tabulated, and methods are described for the treatment of waste gases, including those from electricity generating stations. Mr. L. O. Newton's paper (Great Britain) on water treatment briefly discusses the removal of oil from boiler feed water by the use of aluminium hydroxide as a coagulant, together with the alternative method of electrical coagulation.

In Mr. A. Splittgerber's contribution on heat economy and boiler water treatment in Germany reference is made to the difficulties encountered in the preparation of water for electric steam boilers, because the ordinary methods of softening are not permissible, the water being used as a resistance for heating purposes.

Electrolytic water treatment for the prevention of corrosion and boiler scale, especially in hot-water systems, is dealt with in a paper submitted by Mr. T. C. Thomsen (Denmark). Scientific opinions are cited and the advantages and disadvantages of various systems mentioned, attention being called to the probability that preceding corrosive attacks form the basis for boiler-scale deposits.

A method is described whereby hot service water may, in a very simple manner, be subjected to slight electrolysis, thereby modifying the composition of the water in such a manner that it has no tendency to deposit lime or to corrosive attacks. A convertor furnishes d.c. at from 6 to 10 V, which is fed to an anode inside the boiler it is desired to protect, the electrical conductors being carried through insulating attachments. The negative pole is connected to the boiler shell, which thus acts as the cathode. The anode is usually aluminium, but can be iron or carbon.

The electrolytic action thus takes place where the water is at its highest temperature; this causes quick reaction, fifteen to twenty minutes sufficing to create equilibrium. Water coloured red with rust becomes clear and free from iron, while the scale in choked pipes is reduced and apparently never accumulates again.

Advantages of the Trolley Bus (*Concluded from preceding page*)

regard to brake liner wear and the distribution of heat. A point which he wished to emphasise was that the rotary rectifier and the new distribution system had altered the whole position; the thing to do was to consider the regenerative and field equipment side by side. One was very simple and the other highly complicated. He was informed that there was more than 1,300 ft. of cable on the chassis alone on a regenerative bus. Air brakes would pull up a vehicle quicker than electrical brakes.

Regulations were necessary, but they did not wish to have to present each individual trolley bus for approval. It was essential to know that if a particular trolley bus were approved to-day it would be approved again to-morrow. Producers wanted to know that purely with the object of laying out their work beforehand.

A new German development in the use of low-grade fuels is described in a paper by Mr. B. Krämer, who gives details of a "mill furnace" (pulverising and firing in one process) and examples of installations and results obtained. The method has been developed at the Golpa-Zschornewitz power plant (Central Germany) for burning lignite. In front of the combustion chamber proper is a separate upright chamber into which the lump fuel is admitted at the top. It falls on to a grinding mill at the bottom of the rotating multi-hammer pattern, below which is admitted a mixture of hot air and flue gases that helps to dry the fuel. This rising current transports the pulverised fuel upward into the combustion behind, the radiation from which effects the drying of the fuel. Separate dryers, bunkers and pipes are not necessary, and the usual burners are replaced by simple entrance openings. Installations of this type have been made for boilers with outputs of from two to 125 tons of steam per hour.

Pasteurising Milk

A paper by Mr. A. H. W. Aten (Holland) shows how simple it is to pasteurise liquids electrically. Fish and other organisms in liquids are killed when subjected to a sufficient potential difference between the head and tail. The smaller the organism the higher must be the voltage; thus, by regulating the voltage the larger types can be killed without harming the smaller. The use of high voltages rapidly heats the liquid, so that it is questionable whether bacteria are killed directly by electrical action or indirectly on account of the rising temperature.

For pasteurising milk the United Dairies of Amsterdam use six short tubes of insulating material (glass) placed one on top of the other to form a column. They are separated by seven electrodes (graphite plates fitted with rubber rings inside the glass tube) perforated to increase the active area and to allow the milk to flow through them upward along the glass tube. Alternate electrodes and the bottom inlet and top outlet caps are earthed, while the three remaining unearthed electrodes are connected to a three-phase supply. The electric current thus flows through the milk stream from the central electrodes to those above and below them, and by regulating the milk flow the temperature can be adjusted.

The length and diameter of the glass tube are dependent upon the voltage between the electrodes (220-380 or 3,000 V). At 70 deg. C. *B. coli* and *B. tuberculosis* are destroyed in milk within 30 sec. The total number of bacteria is reduced to one per cent. of that originally present, while milk so treated retains the flavour and other properties of raw milk, its keeping quality being good. One kWh will pasteurise 14 litres, or 28 litres when a heat-exchanger is added.

Progress in Japan

The anodic oxidation of aluminium and its industrial applications are explained in a paper by Mr. Akira Miyata (Japan). Such treatment mechanically strengthens the surface of the metal, protecting it against abrasion, corrosion and chemical attack. The film obtained from an oxalic-acid electrolyte is thick enough for such purposes, and pitting of the surface has been overcome by electrolysis with a.c. superposed on d.c. Porosity of the film is reduced, thus making it more resistant to chemical attack without reducing its superior mechanical strength, by waterproofing after suitable chemicals have been absorbed by the film. For this treatment the oxidised articles are put into a closed vessel and heated by steam under pressure.

Such films can be used as electrical insulation, or to radiate or absorb heat; they also serve as media for the electroplating, painting and dying of aluminium; they will absorb certain chemicals, and their small coefficient of expansion permits them to be employed on the bimetal principle. Such oxide films have been used as heat-proof electrical insulators for wires, transformers, induction motors, induction heaters, electro-magnets, for supporting the elements in flat-irons, and for making electrical condensers.

Recent developments in the electro-chemical industry in Japan are outlined by Messrs. T. Tanahashi, T. Shoji and M. Otani, who point out that most of the plant used by this industry is now made in Japan. The authors describe the d.c. machines employed, especially in the manufacture of synthetic ammonia, aluminium, and caustic soda. For instance, the Chosen Chisso Hiryo K.K. has a sub-station equipped with thirty-nine 4,500-kW, 500-V rotary convertors, a total of 175,500 kW. In Japan rotary convertors with world record ratings have been manufactured, such as 6,600-kW, 60-cycle sets, 6,000-kW, 50-cycle sets and 15,000-A, 4,500-kW

sets. The electro-chemical industry in Japan consumed about 4,000 million kWh in 1934, roughly four-tenths of the total output of hydro-electric power.

A contribution by Prof. W. Palmaer (Sweden) gives details of a method of removing electrolytically small quantities of iron from solutions of aluminium salts, based upon precipitation by electrolysis when using a cathode of streaming mercury. In this way iron can be removed from solutions of aluminium salts, especially sulphate of aluminium, to the extent necessary to produce sulphate of aluminium free of iron, as needed for paper mills and other purposes. By decomposition of the purified aluminium sulphate by heating, aluminium oxide can be obtained which is sufficiently pure for the manufacture of aluminium metal. The aluminium sulphate used in the process is made from clay. The method has proved to be economical and a plant is running in Sweden, while another is now to be built abroad. The method may also be used to remove other metals than iron from certain salt solutions.

The electro-metallurgical and electro-chemical industries that are based on Norway's water power are the subject of Mr. E. Svanoe's paper, which points out that a capital of more than one milliard kroner is invested in the thirty-six undertakings throughout the country. In 1934 these industries turned out finished products valued at about 154 million kroner.

Electric Heating Methods

Mr. C. E. Daniels (U.S.A.) describes induction heating in the chemical industry as of relatively recent origin. However, resistance heating has been used for many years, but its high cost has prevented its extended use. One of the earliest applications of inductive heating was for melting steel, the metal forming a closed circuit in which enormous currents were generated. Local overheating is one of the chief objections to resistance heating. A very good way of conveying heat at temperatures up to 300 deg. C. is by using a secondary fluid, *e.g.*, oil or diphenyl, which is heated electrically and circulated round the jacket of the vessel to be heated. By this means the temperature is under control.

Mr. H. W. Gonell (Germany) deals in a practical manner with the difficult problem of determining quantitatively the gain composition (particle diameter) of powders too fine to be screened. For the examination of such powders the author reviews the possibilities of different methods, including the employment of X-rays and application of electronic radiation.

Outlining methods of producing concentrated fertilisers from poor phosphates, Mr. E. Britzke and Prof. S. Volfkovich (U.S.S.R.) emphasise the need for special study of means of concentrating the raw materials by electro-magnetic and other methods, together with the further development of plants for the electro-thermal and blast-furnace treatment of phosphates, the production of metallurgical slags containing phosphorus, &c. They further advocate the co-ordination of fertiliser production with the fuel, metallurgical, nitrogen and other industries.

Plant Exhibition

A concurrent display of equipment, also at the Central Hall, Westminster, has been organised by the British Chemical Plant Manufacturers' Association, with a section arranged by the Department of Scientific and Industrial Research. The exhibitors include the following:—

The Aluminium Plant & Vessel Co.—Varnish kettles and synthetic resin stills; welding of copper, aluminium and stainless steel.

The Audley Engineering Co., Ltd.—Special valves, such as the high-vacuum pattern utilised in the Cavendish Laboratory, Cambridge, for atomic research.

Bennett, Sons & Shears, Ltd.—Automatic plant for producing distilled water with a resistance of 450,000 ohms per cu. cm.

The British Oxygen Co., Ltd.—Welding plant, flame-cutting machines and metal-spraying equipment.

Thomas Broadbent & Sons, Ltd.—Centrifugal separators and precipitators, electrically driven, both directly and separately.

Cannon Iron Foundries, Ltd.—A steam-jacketed still with a motor-driven agitator and other synthetic resin plant.

Hathernware, Ltd.—A stoneware pump of single block construction directly coupled to a small electric motor; also a motor-driven armoured pump encased in iron.

International Combustion, Ltd.—A range of "Hum-mer" electric screens, the new "38 Junior" having a single top vibrator and being capable of working off an ordinary lighting circuit.

The International Electrolytic Plant Co.—Standard cells for producing hydrogen and oxygen.

George Kent, Ltd.—A new "Multilec" instrument that is capable of recording and also controlling any condition (such as temperature, conductivity, hydrogen-ion concentration) which, through the action of a primary element, sets up an electromotive force varying with the condition.

The Kestner Evaporator & Engineering Co., Ltd.—Electrically heated "Merilene" hot oil-circulation plant for quick and uniform heat treatment of liquids under accurate temperature control up to 600 deg. F., also a portable electrically driven stirrer and a transformer breather operating on the silica gel principle.

Thomas Locker & Co., Ltd.—Conveying and screening plant, wire cloth, gauze and perforated sheets in all metals, including 200-mesh "Staybrite" steel.

Manesty Machines, Ltd.—Automatic stills for distilling water, heated electrically and otherwise; also tablet-making machines for preforming moulding powders, granulators, mixers, &c.

Manlove, Alliott & Co., Ltd.—Filters and dryers, and a motor-driven "Weston" type centrifugal separator.

Negretti & Zambra, Ltd.—Recording and controlling instruments, including temperature regulators of the thermo-electric type for up to 1,400 deg. C. Tempering instruments are included.

Premier Colloid Mills, Ltd.—For manufacturing emulsions and pastes, directly driven by high-speed motors.

The Saunders Valve Co.—Valves, with a variety of means for operating them from a distance by fluid pressure. One automatic type is held open by oil pressure exerted by a small electrically driven pump.

George Skey & Co., Ltd.—Stoneware, such as plating tanks and non-conductive electrical wares.

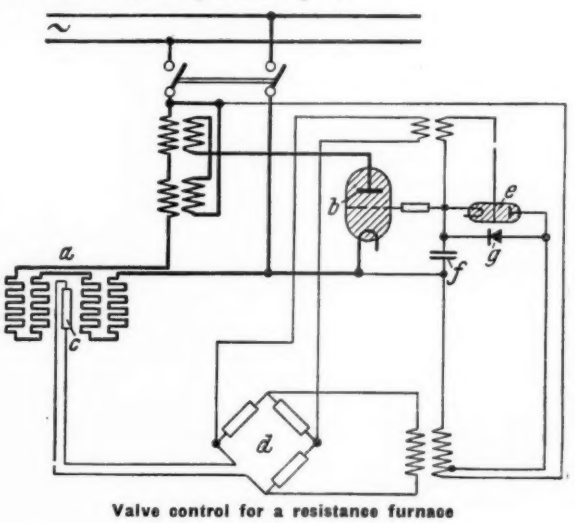
Works Tours

Among the large number of factories, colleges and research institutions which have been visited are the Fuel Research Station at Greenwich and the works of George Kent, Ltd., Luton (control and measuring instruments), J. and E. Hall, Ltd., Dartford (refrigeration and evaporation machinery), General Electric Co., Ltd., Wembley and Hammersmith (research, lamp, valve, and glass manufacture), Fescol, Ltd. (electro-chemical deposition), and the London Power Co., Ltd. (Battersea generating station).

Automatic Control of Resistance Furnaces

THE high sensitivity and lack of inertia in the grid control of thermionic rectifiers permit the latter to be applied to the automatic regulation of electric furnaces, using an electric resistance thermometer to control the grid potential and thus increase or decrease the furnace current as necessary.

Th arrangement shown by the accompanying illustration from *Zeitschrift des Vereines deutscher Ingenieure* (Vol. 80, p. 240), is applicable to furnace temperatures up to about 1,472 deg. F.; for higher temperatures, a bolometer or photo-cell can be used in similar manner to control the rectifier. In the diagram, *a* represents the heating elements of an annealing furnace, and *c* an electric resistance thermometer in a bridge circuit *d* which is adjusted to balance at the desired furnace temperature. At other temperatures, the bridge voltage controls the operation of the rectifier *b* to increase or decrease the furnace current as required. During the negative half-wave, the condenser *f* is charged through the metal rectifier *g*, so that the rectifier *b* receives a negative grid potential and is therefore blocked during the first part of the ensuing positive half wave. The condenser discharges through the valve *e* during the positive half-wave and when its voltage has fallen to the firing voltage of *b*, current flows through the latter. The rate of discharge of the condenser is controlled by the bridge voltage which is applied to the grid of *e*. If the condenser discharges quickly, *b* fires early in the positive half-wave and the furnace current is increased. With this equipment, the temperature of the furnace can be kept constant at 1,472 deg. F. ±9 deg. F.



Valve control for a resistance furnace

With the I.E.E. in Scotland

An enjoyable summer meeting

LAST week's summer meeting of the Institution of Electrical Engineers in Western Scotland attracted over 200 members and their ladies, apart from local hosts and officials. The tourists assembled on Monday evening (June 15th) at the Central Station Hotel, Glasgow, for a reunion. Dancing followed the reception by the President, Mr. J. M. Kennedy and Mrs. Kennedy.

Tuesday was devoted to a visit to the Galloway hydro-electric power scheme. After an early breakfast on the special train from Glasgow to Dalmellington the party was conveyed by coaches over the " roof " of the watershed where the catchment area commences. Rain did not deter the visitors from inspecting the Tongland dam and salmon " ladder," the longest and highest in the British Isles. The power station and adjacent C.E.B. sub-station were visited also, a peculiarity of this scheme being the varied nature of the water resources and the arrangement of the tunnels, dams and power houses which have been disposed with due regard to amenities. Without the grid the full benefit of this project could not have been realised, for it is operated as a peak-load scheme to assist the thermal stations in mid-Scotland and northern England in winter when most water is available in South Scotland. The average annual load factor is necessarily low, actually about twenty per cent.

At the I.E.E. summer meeting: Sir T. Purves and Lady Purves with Mr. and Mrs. Rowell, and (right) Sir Archibald Page at a picnic luncheon at Laggan Reservoir. Top, delegates entering Stirling Castle

The Galloway Co. has powers to utilise a catchment area of 400 sq. miles in the watershed of the Rivers Ken and Dee. There are five generating stations, and Loch Doon that used to drain westward into the sea has become the principal storage reservoir for four of them with a total capacity of 2,900 million cu. ft. Dams and tunnels have been so placed as to enable the same water to serve three stations at Kendoon, Carsfad and Earlstoun. These comprise the second stage of development—two 10,500 and four 6,000 kW sets.

Luncheon and tea were provided by the company at the (County) Town Hall of Kirkcudbright and the return drive was by way of the great artificial reservoir at Clatteringshaws with a capacity of 12.25 million kWh. This augments the waters used at the Glenlee and Tongland stations (two 12,000 and three 11,000 kW sets) which constitute the first stage of development and have been in full commercial operation for over a year. During the return drive it was noticed that the marshy ground necessitates practically every telephone pole being stayed, in many cases four stays per pole being required. At Girvan passengers were transferred to a special train on which dinner was served on the way back to Glasgow.

On Wednesday members were the guests of Messrs. Babcock & Wilcox, Ltd. They embarked at Glasgow on the T.S.S. *Queen Mary II* and steamed down the Clyde to Renfrew, where they landed in heavy rain for a tour of the company's boiler works, which occupy 160 acres and employ 5,500 people.

After the morning's rain brilliant weather favoured the delightful cruise down the River Clyde during the afternoon and evening. The return to Glasgow was made by special train from Gourock.

On Thursday morning alternative works visits were arranged to the Scotstoun shipyards of Messrs. Yarrow & Co.; the Clyde's Mill power station of the Clyde Valley E.P. Co.; the Bridgeton Works of Messrs. Mavor & Coulson, Ltd., and the new Glasgow stores of Messrs. Lewis's Royal Polytechnic, Ltd., all of which were described in our issue of June 5th, page 811, as were other places of interest mentioned. Several members chose to visit Alloa, with a brief halt at Stirling Castle, for a tour of the B.E.P. works of the Harland Engineering Co., Ltd., which, since it absorbed the British Electric Plant Co. in 1919, has increased the number of its employés from 100 to 850.

After an afternoon drive along Loch Lomondside they were joined at Tarbet by the rest of the party, which had travelled by road from Glasgow. Continuing along the lochside road the coaches passed the last remaining portion of the old Caledonian Forest to Crianlarich, passing by 3,708-ft. Ben Lui, the source of the River Tay. Descending into Dalmally there is a wonderful vista of mountainous scenery; then on by Loch Awe and the noble ruins of Kilchurn Castle through the deeply impressive Pass of Brander. So by the coast road we rounded the promontory, after Connel Ferry, for the final descent to Oban Bay and a magnificent sunset over the Western Isles. One or two early risers were rewarded with a glimpse of the sun's eclipse on Friday morning, while still hardier folk found before-breakfast sea bathing very cold.

A special train took us through the glens behind Oban along Loch Etiveside, across the cantilever bridge at Connel, on the north side of which stretches the Moss of Achnacree, and northward on the edge of Loch Linnhe to Ballachulish. There we changed to motor coaches and proceeded to the strange township of Kinlochleven at the head of Loch Leven, where there are electric trams, shops and a community which produces aluminium with the aid of hydro-electric generators, each producing 8,000 A at 250 V d.c., for the oxide reduction furnaces. Down the northern shore of Loch Leven and through Fort William we passed another factory (inactive just now owing to a strike of employés) with its rising pair of pipe lines at the base of Ben Nevis, which represents the third and largest successful utilisation of highland water power for the manufacture of aluminium.

Proceeding by the rising road to where aforetime the River Spean flowed from Loch Laggan we were confronted with an empty gully and the graceful sweep of the Laggan dam now forming a reservoir twelve miles long and half a mile wide. On the parapet by the roadside a bronze model illustrates the layout of the scheme. A tunnel 2¾ miles long connects Loch Laggan and the still higher Loch Trieg, the former's dam being 700 ft. long by 117 ft. high and the latter's 675 ft. long by 122 ft. high, with a combined capacity of 60 thousand million gallons of water.

There by the artificial, though picturesque, lakeside with the peaks opposite still snow-clad a picnic luncheon was provided by the British Aluminium Co., Ltd., and tea also on the return drive through the awe-inspiring Pass of Glencoe.

The day's tour of more than 230 miles by road was completed along the great new motoring highway through Glencoe where the green colour of the rock and of the river at the Studdie is noteworthy. The old inn at Kingshouse marked the beginning of the desolate water-logged Moor of Rannoch. On the Tyndrum and Crianlarich we came to Callander for the last night of an excursion which, despite a very wet beginning, fully justified the optimism of its organisers and should be the most memorable of the three which the Scottish Centre (chairman: Mr. J. B. Mavor; hon. secretary: Mr. J. Taylor) has arranged.

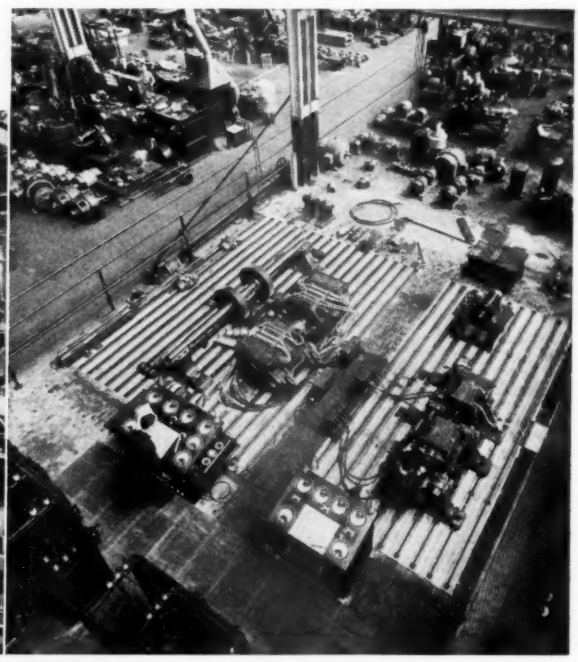
Motors, Switchgear and Instruments

The Chelmsford works of Crompton Parkinson, Ltd.

WHILE the electrical products now going through the Chelmsford works of Messrs. Crompton Parkinson, Ltd., have at least as much to interest the engineer as they have always had, their appeal is rivalled by the methods of manufacture that are due to a recent reorganisation. It was difficult to realise during a recent visit that the existing Writtle Road works date back to 1895 (when they superseded the original Crompton works which was started in 1878) as the flow-production methods adopted much more than meet the conditions of large-scale production; they are flexible enough to be readily adaptable to non-repetitive work also.

One of the most notable successes of British electrical manufacturers during recent years has been in the ability they have shown to meet the growing demand for fractional horse-power motors. In the growth of this vigorous branch the Crompton "Minor" motor (1/20th to 1½ h.p.) has played an important part, and every 1½ minutes one is sent out into the world, one in every four being a d.c. machine. We were able to observe the manufacture of details of these machines in seventeen 510-ft. bays, the assembly of these parts and their passage through one of the four silence rooms where performance tests are carried out prior to flash testing and dispatch. Conveyors and a moving test bench are indispensable features of the system. The former is also used as a store for end-shields and parts not immediately wanted; distinctive labelling prevents the possibility of any item travelling round forgotten, and in addition enables a check to be kept on jobs that are behind schedule time.

Activities at the Crompton Parkinson works, Chelmsford. Left: Erecting "Klad" units in the switchgear department. Right: Traction motors on test



A simple costing and stores system provides the productive units with their material with the minimum of requisition forms and the cutting out of waiting time. One notices particularly the number of boring drills installed to perform the kind of work usually associated with lathes, the diamond tools for giving the finish to the bushes of the "unspillable" bearings (which are so made as to require oil replenishment only once in two years), and the means of automatically taking up bearing end-play and of spigoting the end-shields to frame prevents noise of vibration. Large motor practice has been followed closely with a view to securing robust construction, since the operation of fractional h.p. motors is often left to entirely unskilled persons.

At the Chelmsford motor department are also made all d.c. motors, a.c. induction motors above 200 h.p. (those between "Minor" capacity and this figure being dealt with at Guiseley), a.c. and d.c. generators, auto-synchronous motors, phase advancers, and fans. The section devoted to the larger machines comprises thirteen bays.

In the relatively new traction department, with which Messrs. Allen West & Co., Ltd., are associated, we saw several of the trolley-bus and tramway motors in course of construction for the London Passenger Transport Board, in addition to equipment for the Tyneside electrification and for the Armstrong-Whitworth Diesel shunting locomotives for the L.M.S.

The switchgear department is in an entirely separate building, still known as the "old lamp shop" because the first British arc lamps were made there. Circuit-breakers for direct, remote-manual or electrical operation with rupturing capacities up to 350,000 kVA and for voltages up to 11 kV are manufactured here, chiefly for distributing centres and rural sub-stations. Examples of the largest of the range (truck-type with duplicate bus-bars) for Ilford Corporation are now going through the works, in company with a number of metal-clad oil and compound-filled breakers for 250,000 kVA at 11 kV for the Central Electricity Board and several supply undertakings.

A notable exhibit consisted of oil switches tested in accordance with the B.S. Specification No. 116 for rupturing capacities ranging from 100,000 to 350,000 kVA. Inspection revealed that they had stood up to the ordeal exceedingly well. In some of these tests, we were informed, the breakers were closed under fault conditions by hand and operated by overload releases, which were shunted by time-limit fuses energised from current transformers in the circuit, thus closely representing working conditions.

Compound-filled switchgear of the vertical isolation drop-down type (single and duplicate bus-bars) with oil-filled instrument-transformer chambers was also in evidence. These units are assembled complete at the works and arranged for easy erection on site, where the compound is added.

For systems operating at 3.3 kV or less, "Klad" switchgear up to 800 A (with or without vertical isolation link and with mechanical lowering of tank and of complete breaker) was to be seen in various stages of manufacture. The overload tripping mechanism for each phase consists of a multi-turn coil carried below the oil-switch cross-bar and inaccessible when alive. A large switchboard of this type is being completed for London University.

To judge from the number being made, the automatic fuse-type oil switch, known as the "T.A.P.," seems to have fulfilled expectations in providing an economical protection for circuits up to 11 kV and 150,000 kVA, especially when used with the "ring-main units." The tin-lead alloy oil-immersed fuses with steel cores are designed to carry continuously 80 per cent. of full-load current. A fuse is connected in series with each switch blade, which is opened by a toggle mechanism when the fuse blows. It has been found that the rapidity of action of the fuse results in interruption before the contacts of an ordinary oil switch would have begun to part.

Another sign of suburban and rural electrification activity is to be seen in the kiosks ready for work, apart from the putting in of the transformer and connection of cables.

Adjoining the switchgear department is the section devoted to the manufacture of instruments. Here the different models of the "Tong-test" were observed among other portable and stationary instruments.

The Chelmsford works now cover 14½ acres and give employment to nearly 2,000 people (in the ratio of three men to one woman worker).

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Electricity in the News

I enclose two cuttings from two of this week's editions of a daily contemporary. As we all know, apart from the usual daily paper custom of attributing 100 per cent. of fires to electrical causes, they also attribute all freedom from destruction and explosion where electricity is involved as miraculous.

Is it not about time that either the Press had sufficient technical staff or their reporters were sufficiently technically educated to be able to discriminate between probabilities and impossibilities?

In one report a horse rider was supposed to have been miraculously saved when he was thrown from his horse, after his horse had received a fatal shock through contact with a 230-V cable. Unfortunately the paper does not give details as to why a horse should get a shock by digging its hoofs into turf, or why the cable should be so near the surface, and why so easily punctured. Apart from the 10,000,000 to one chance of his being killed, being thrown from his horse gives him an infinite number of chances of ever receiving a shock, even if a pressure of 230-V would have succeeded in hurting him.

In the other cutting a lavatory attendant stripped and entered a flooded lavatory to switch off the electricity, averting a serious explosion. I admit the plucky action, but do not the Press as well as the public realise that the mere switching off would still leave the switch itself alive, and thus for all practical purposes the action would be abortive, also that the likelihood of any explosion in such circumstances would be remote.

One gets rather tired of scare headlines in daily papers, and the electrical industry is not helped by such glaring inaccuracies.

ANNOYED.

June 18th.

The Santon Water Boiler

May we respectfully point out, and ask if you would correct, a statement made by you when referring to the Santon automatic water boiler on page 854, of your June 12th issue. It is there stated that the boost load of this equipment is 6 kW, although it is actually 4 kW, as indicated on our leaflet, a copy of which is enclosed.

We would also mention that this boiler is entirely automatic both in reference to the control of water and electricity, and is efficiently lagged to minimise heat losses. The auto control also minimises steaming and therefore prevents liberation of dissolved oxygen from the water.

SANTON, LTD.

Newport, Mon.

Safety in the Home

Mr. Lawson's article in your issue of June 19th will be read with real interest by all installation men, the great majority of whom will share the views put forward as to the risks involved in earthing articles with exposed elements or of open construction. The logical conclusion to be drawn from Mr. Lawson's article is that the I.E.E. Regulations are at fault in insisting upon this form of protection in all cases. In order to shift the burden of responsibility from their own shoulders and place the onus upon the accepted wiring code, many of our leading installation engineers provide the earth connection to such apparatus as Mr. Lawson deprecates, against their better judgment.

The chief reason for Mr. Lawson's doubt as to the wisdom of indiscriminate earthing appears to be based upon (a) undetected failure of earthing protection, and (b) the use of heavy overload currents for this purpose. Would not Mr. Lawson agree that if both of these defects could be eliminated from our earth circuits, he would endorse the earthing of every piece of apparatus in the home?

I claim that with the use of the earth-leakage trip, the earth circuit becomes immediately and easily testable, and protection is afforded independently of the circuit fuses. Contact between the live element and the earthed frame can be shown to provide nothing worse than an unpleasant shock, if the installation has been properly designed and the many curious ideas regarding these devices are not allowed to prevail.

Folkestone, *June 20th.* T. C. GILBERT.

I would like to comment upon two or three points in Mr. Lawson's interesting article. It is now agreed generally, one thinks, that three-pin socket outlets should be employed throughout, but in some quarters it is urged that to introduce an earthed appliance to earth-free rooms is to invite danger, and that in these rooms the earth socket should not be connected to earth. Nevertheless, the following weighty reasons support the standard (*i.e.*, complete) connection of the socket outlet:—(1) The I.E.E. Regulations call for (in effect) earthing everywhere and of everything that is metal encased; (2) An "earth" may at a later date be brought into an earth-free environment; (3) Even in an earth-free room nobody can contemplate with equanimity apparatus with a casing that is alive to earth. Of far greater importance is the difficulty of ensuring an efficient earth system throughout.

Mr. Lawson mentions the well-known case of a child who was killed due to the use of an earthed radiator. But, in my judgment, this does *not* support his argument. The radiator was, it is true, earthed; one must remember, however, that the element was open-circuited and the wall-switch "on," and that an "across" shock would also be possible, *i.e.*, the radiator should not have been ready for use.

In all these discussions upon safety the I.E.E. Regulations do not receive adequate attention. They form our best national code, and should be accepted as such, not only by corporate members but by all responsible bodies: local ideas ought to be taboo. These Regulations call for earthing throughout, and so metal-encased radiators must be earthed. With a badly designed radiator of the "red-hot wire in an open biscuit-box" type there may be a hazard in this, but I consider the general danger worse without earthing.

Some of us urge that a bigger effort should be made by manufacturers to provide fires that are either contained in non-conductive casings or have elements fully protected by some such means as an (electrically) non-conductive covering. Mr. Lawson would prove a sturdy recruit: I invite him to join our ranks.

G. E. MOORE.

Sunderland, *June 22nd.*

Overhead Lines and Thunderstorms

The advantage of underground cable for rural networks due to its freedom from breakdown through lightning, together with its higher surge impedance, is a consideration which is not fully appreciated until the dislocation of service occurs, with the blowing of fuses, rupturing of insulators, and tripping of breakers to which high-voltage overhead systems are especially vulnerable in a thunderstorm.

It is no consolation to the consumer that weather conditions are responsible for clocks, cookers, incubators, refrigerators and farm machinery becoming inoperative. It is a financial loss to the owners of timber mills, milk factories, quarries and brickworks for their work to be stopped until line repairs are executed.

Nor is it possible for the district engineer and his staff to prevent million volt surges with currents up to 100,000 A travelling along the line. Repairs may be executed under difficult conditions through darkness and pouring rain and the section again switched into commission with all possible haste but nothing can be done to prevent a similar breakdown later, to say nothing of the apprehension caused through the knowledge that insulators, and transformer and switchgear insulation have been overstressed and weakened.

It seems that rural electrification authorities give too much consideration to first cost of transmission systems to the detriment of continuity of service and reliability.

June 22nd. OUT OF SIGHT OUT OF MIND.

The Kingston Electricity Department

Readers will recall that about two months ago the Kingston-on-Thames Town Council gave the borough electrical engineer (Mr. T. A. Kingham) three months' notice terminating his engagement and it was announced that papers relating to contracts and other matters were to be sent to the Director of Public Prosecutions. At the meeting of the Council on Tuesday last it was reported that the Town Clerk had received a letter from the Director of Public Prosecutions expressing the opinion that the matter was not one in which he would be justified upon the evidence available in instituting criminal proceedings and he had therefore decided not to intervene.

It was also stated that steps were being taken to defend an action being brought against the Council by a firm of coal contractors, and the question of a counterclaim was being considered.

The Electricity Committee has appointed a sub-committee to select five of the applicants for the post of borough electrical engineer for interview by the Committee on July 3rd.

D

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

"Washwell" Wash-boilers

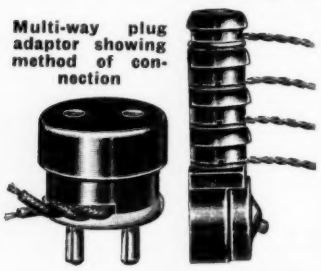
Two additions have been made to the range of electrically heated wash-boilers made by Messrs. SAMUEL SIMISTER & Co., Croston Street Copper & Tin Works, Bolton, and for which Messrs. HOGAN & WARDROP, LTD., 25, Old Street, London, are the London agents. The new models are known as the "Washwell" Nos. 7 and 9. No. 7 is a low-priced machine of orthodox design fitted with 2-kW plug-in type elements, having a capacity of 7½ gal. The pan is of tinned copper, a brass draw-off tap is fitted, and 6 ft. of three-core flexible is supplied. Two-heat switches can be supplied at a small extra cost.

The "Washwell" No. 9 washboiler

The other model is intended for use with baths. Cold water is poured into the funnel in the top of the boiler, and this drives the hot water out of the pipe at the side. The body is made of 24-gauge galvanised steel, a tinned copper pan being fitted inside; galvanised steel is also used for the top and for the lid, which is hinged. Two switches, shielded from splash-water, are fitted into the side of the container, and 6 ft. of three-core cable is supplied as standard.

Multi-way Adaptors

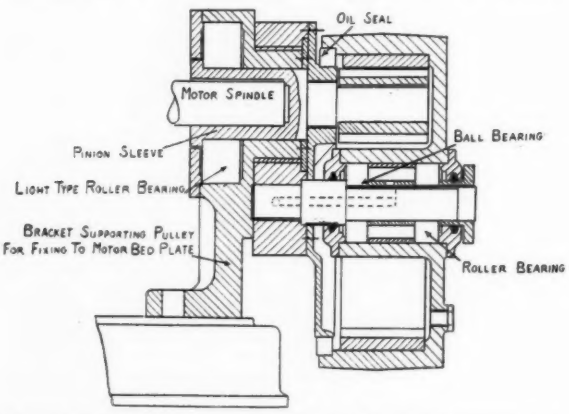
Multi-way plug adaptor showing method of connection



Multiple plug adaptors for 2-A socket outlets, both two- and three-pin, have recently been introduced by MESSRS. DAVIES, KENT & STEWART, LTD., 17, Berners Street, London, W.1. They are neat and robust in construction, and any number can be connected together within the limit of the amperage allowed.

Automatic Flexible Transmission

MESSRS. WEARN'S AUTOFLEX DRIVES, LTD., 2, Sloane Terrace, London, S.W.1, have just introduced an "Autoflex" pulley which can easily be fixed to any motor of recent date and which does not necessitate, as in the case of the earlier model, a slightly longer motor spindle. The manufacturers inform us that by the use of the pulleys, which are short centre ratio reduction units, any change in the load, no matter how small, is accompanied by a corresponding change in the belt tension,



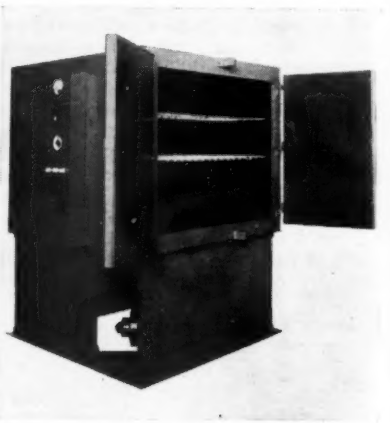
A cross section of a Wearn's "Autoflex" pulley for connection to any type of electric motor

an ordinary flat belt being used. Thus no power is required in overcoming the inertia of tight belts, shafting and bearing friction, and belt maintenance is eliminated. The motors can be erected in any position relative to the machinery to be driven or built in to the body of the machine. Speed reduction is from 5-1 to 40-1.

Several users of the earlier model pulleys claim to save over 20 per cent. in power consumption. Installation is inexpensive and upkeep costs are negligible. Group driving is simplified and damage to the motor through starting overload is avoided. A large number of the company's drives and pulleys have recently been installed in factories, &c., in Great Britain while in New Zealand (where they originated) some 7,000 are now in use.

Electric Drying Ovens

"Evenheat" electric drying ovens are a recent production of Messrs. MITCHELL GRAHAM & SON, LTD., 56, Buccleuch Street, Edinburgh. They are designed on the principle of maintaining a steady flow of hot air evenly distributed throughout the oven space, and, to ensure uniform drying, the heated dry air is not only introduced at the foot of the oven space, but also at other points in close proximity to the upper trays carrying material to be dried. The heating units are easily detachable but completely protected, an extensive range of loadings being made available by means of selector switches: in addition there are "Vernier" heating units of low rating which are automatically controlled and maintain a constant temperature. Protection is also afforded in the event of an excessive temperature rise due to any cause. The operating range of temperature of the standard model is from 70 to 100 deg. C., and five sizes are available with cubic capacities of from 7.5 cu. ft. to 52.5 cu. ft.



The "Evenheat" drying cabinet

A Flameproof Transformer

For use in conjunction with flameproof power and lighting cable couplings MESSRS. GEORGE ELLISON, LTD., Perry Barr, Birmingham, 20, have produced a flameproof transformer. It is designed for use on single-phase circuits and is intended for lighting and small power loads, providing an easy means of tapping power mains to obtain a low-voltage circuit.

The Ellison flameproof transformer

One size only (1-kVA) is made. The transformer can be quickly connected to a cable end, straight through, or three-way power supply coupling by bolts and links. The low-voltage outgoing circuit is taken through an Ellison lighting cable end coupling. The primary winding has clearly marked tappings for 400, 440, 550 or 660 V circuits; the terminals of the secondary winding, however, are permanently connected to give a maximum current of 10 A at 125 V. The mid-voltage point of the secondary winding is earthed through a link which is removable for testing. While the transformer is air-cooled and housed in a steel tank it can be filled with oil as it is of welded construction. The tank is surmounted by a switch and fuse chamber containing a quick-break knife switch controlling the supply to the primary of the transformer. The cover of the fuse box is mechanically interlocked with the switch handle, and the interlock bar can be padlocked. The complete assembly is mounted on skids to facilitate transport.

Canadian Electrical Trade and Manufacture

THE Canadian Government has just published returns of foreign trade for the year 1935. From these have been extracted the following figures showing values of imports and exports of electrical goods, with principal countries of origin and destination, and notes of increases or decreases compared with 1934. The total value of imports, at $8,484,000, was $830,000 more than in 1934, and the share of the United States stood at $7,443,000, an increase on the previous year of $608,000. Imports from the United Kingdom were valued at $916,000, against $656,000 in 1934, the rise being largely under the item "turbo-generator sets, 700 h.p. and over, of a kind not made in Canada."

On the other side of the account exports of electrical goods totalled $2,734,000 in value as compared with $2,131,000 in 1934. The Dominion's export trade in such apparatus is extending widely; only the leading destinations are shown in the following table. The United Kingdom is an important market and accounted for $612,000 out of the above-mentioned total of $2,734,000. These figures, however, do not include vacuum cleaners, which are not classified in the electrical group. Exports of these machines from the Dominion last year amounted in value to $635,000, or two and a half times the value in 1934, and $547,000 worth were sold in the United Kingdom. On the whole the United Kingdom bought more electrical material from Canada than she sold to the Dominion.

IMPORTS.

	1935. $(000).	Inc. or dec. on 1934. $(000).
Batteries, primary—		
Total	124	+ 34
From United Kingdom	10	+ 5
„ United States	113	+ 28
Batteries, storage—		
Total	136	− 13
From United Kingdom	52	+ 18
„ United States	84	− 30
Heating apparatus—		
Total*	54	− 22
Dynamos and parts—		
Total	248	− 17
From United Kingdom	47	+ 13
„ United States	192	− 25
„ Germany	6	+ 3
Fans and motors—		
Total*	19	+ 2
Fuses, plugs and cut-outs—		
Total*	64	− 7
Lamps, carbon filament—		
Total	19	− 16
From United States	15	− 13
„ Japan	3	− 3
Lamps, metal filament—		
Total	131	+ 12
From United Kingdom	1	—
„ United States	105	− 2
„ Japan	23	+ 12
Torches, flashlights, side and tail lights—		
Total	550	+ 90
From United Kingdom	5	+ 2
„ Germany	11	+ 9
„ United States	530	+ 80
Lighting fixtures and appliances—		
Total	208	− 37
From United Kingdom	11	+ 1
„ United States	173	− 44
„ Germany	4	+ 1
„ Italy	6	− 2
Arrestors, choke coils, etc.—		
Total*	33	− 9
Magnetos for i.c. engine manufacturers and parts—		
Total*	10	+ 4
Meters, electric—		
Total	111	+ 19
From United Kingdom	29	+ 5
„ United States	80	+ 12
Motors and complete parts—		
Total	1,100	+ 39
From United Kingdom	210	+ 26
„ United States	868	+ 36
„ Sweden	13	+ 8
„ Switzerland	2	− 31
Rheostats, controllers, etc.—		
Total	342	+ 29
From United Kingdom	32	− 17
„ United States	304	+ 47
„ Switzerland	6	− 1
Electric irons—		
Total*	22	+ 3
Lighting outfits—		
Total*	3	− 1
Sockets, outlets, etc.—		
Total	74	+ 29
From United Kingdom	2	+ 1
„ United States	72	+ 29
Spark plugs, magnetos (other than aforementioned), etc.—		
Total	295	+ 11
From United Kingdom	6	− 5
„ United States	287	+ 17
„ Switzerland	2	− 1
Switchgear, flame-proof, for use under ground in coalmines.†		
Total	15	+ 9
Switches, switchboards and circuit-breakers—		
Total	534	+ 93
From United Kingdom	46	− 5
„ United States	484	+ 99
Telegraph apparatus—		
Total	32	− 130
From United Kingdom	9	+ 2
„ United States	23	− 132
Telephone apparatus—		
Total	451	+ 98
From United Kingdom	78	+ 43
„ United States	372	+ 58
Transformers and complete parts—		
Total	92	+ 15
From United Kingdom	25	—
„ United States	66	+ 17
Radio tubes—		
Total	258	+ 103
From United Kingdom	11	+ 10
„ United States	247	+ 93
Radio apparatus—		
Total	1,695	+ 53
From United Kingdom	86	+ 1
„ United States	1,607	+ 53
Turbo-generator sets, 700 h.p. and over, of a kind not made in Canada—		
Total	187	+ 137
From United Kingdom	162	+ 135
„ Switzerland	6	− 11
„ United States	18	+ 13
Electrical apparatus, n.o.p.—		
Total	1,574	+ 238
From United Kingdom	67	+ 9
„ United States	1,487	+ 226
„ Germany	2	− 3
„ Switzerland	10	+ 2
Total of electrical apparatus, lamps and fixtures	8,484	+ 830
From United Kingdom	916	+ 260
„ United States	7,443	+ 608

* Mainly from United States.
† From United Kingdom.

EXPORTS.

	1935. $(000).	Inc. or dec. on 1934. $(000).
Batteries, storage—		
Total	171	− 28
To New Zealand	51	− 2
„ Argentina	36	− 27
Batteries, other—		
Total	175	+ 95
To United Kingdom	13	—
„ New Zealand	64	—
Radio apparatus—		
Total	145	‡
To United Kingdom	64	—
„ Australia	9	—
„ New Zealand	50	—
Dynamos, generators and motors—		
Total	167	+ 87
To United Kingdom	104	+ 56
„ New Zealand	29	+ 20
Electric stoves—		
Total	746	‡
To United Kingdom	108	—
„ Irish Free State	115	—
„ British S. Africa	411	—
Other domestic cooking and heating devices—	—	‡
Total	20	‡
To United Kingdom	1	—
„ Irish Free State	3	—
„ South Africa	14	—
Spark plugs, magnetos, etc.—		
Total	524	+ 65
To United Kingdom	269	+ 58
„ South Africa	41	—
„ Australia	104	+ 40
„ New Zealand	34	+ 2
Electrical apparatus, n.o.p.—		
Total	290	+ 20
To United Kingdom	13	− 11
„ Brazil	20	+ 7
„ Chile	9	− 23
„ Mexico	46	− 9
„ New Zealand	40	+ 1
Total of electrical apparatus exported	2,734	+ 603
To United Kingdom	612	+ 136
„ United States	47	+ 20
Vacuum cleaners—		
Total	635	+ 380
To United Kingdom	547	+ 346
„ Australia	13	+ 3
„ New Zealand	10	+ 5
„ Irish Free State	59	+ 24

‡ Comparable figures for 1934 not available.

Production of Electrical Equipment

It is of interest to compare the import trade in electrical apparatus with the figures of Dominion manufacture of such goods. These are available for 1934, in which year production by firms in the electrical apparatus and supplies industry was valued at $50,235,000, compared with $35,012,500 in 1933—an increase of 35 per cent. (These values represent selling value at works.) Neither of these totals includes the value of porcelain insulators, electric washing machines and a few other items classified for the purpose of the Census under other headings, the aggregate value of which in 1934 was not less than $13,000,000. On the whole, therefore, manufacture is between six and seven times the value of importation. Out of 174 factories making returns, 130 are situated in Ontario.

If an analysis is made of the principal groups of apparatus included in the total value of production, *viz.*, $50,235,000, it is found that the most important is that which includes motors, generators and transformers, aggregating in value over $14,000,000, an increase of $4,000,000 on 1933. Only $586,000 represented generators (a decline of $230,000 on 1933), but the total value of motors manufactured was $3,085,000 (a 30 per cent. increase on the previous year), of which $1,305,250 represented the selling value at works of 130,776 machines, amounting altogether to 30,926 h.p., of a capacity of one third h.p. or under. These figures relating to motors exclude starting motors.

Cables and conduits constituted the next most important group, with a total value of $11,080,000, or 50 per cent., more than in 1933. About one-fifth of the output in this group represents bare copper wire. Of radio apparatus and parts (excluding valves), the total output was $6,693,000 as against $4,047,000 in 1933. In addition a quantity of radio sets and parts (valued over $2,000,000) are made by firms not classed as electrical manufacturers. The output of radio valves in 1934 was 2,367,674, valued at works at $1,389,815, or rather over 50 cents. each.

With regard to the radio trade, it was reported recently by the Department of Immigration of the Canadian Pacific Railway that a change has been in progress. During 1935 the multi-wave, or selective wave type, was sold most largely, and there was an increase in the proportion of sales of all-wave sets. The number of receiving sets in use in the Dominion is estimated at well over 800,000.

In the transformer group the principal percentage increase was in radio transformers, the output of which doubled in value between 1933 and 1934. Nearly one-third of the production of transformers consists of distribution apparatus, 200 kVA and under, and 15,000 V and below.

Although in 1934 the value of the output of electric vacuum cleaners, at $1,550,000, was rather more than in 1933, it was less than half the 1931 level. Similarly, that of electric washing machines in 1934 was only a little more than half the 1930 or 1931 figure. On the other hand the production of electric refrigerators by all industries in 1934 more than recovered the ground lost in 1933 and stood at just under $4,000,000.

Certified Electrical Wiremen in France

The French Association des Cours Professionnels d'Apprentissage des Monteurs d'Installations Electriques, of Paris, announces that the French Minister of National Education has recently introduced a scheme for granting certificates of professional aptitude to electrical wiremen and fitters in the Seine Department who qualify by passing both a written and practical examination. In the practical tests candidates will be required to install apparatus and remedy certain faults in electrical installations within a set time. The written examination will embrace various subjects ranging from how to make a written application for employment and preparing a report on a job, to questions in geometry, arithmetic and electricity. Candidates will be limited to young people who have had a three years' apprenticeship or have completed their studies in a technical school, or those over sixteen years who have worked in the trade in the Seine Department for three years.

Flameproof Electrical Gear

Apparatus recently approved by the Mines Department

CERTIFICATES of flameproof enclosure were granted by the Mines Department for the following electrical apparatus during the quarter ended March 31st last. As an experiment, a few copies of the list are being offered for sale at 1s. 3½d. (post free), obtainable from the Department's offices, Dean Stanley Street, London, S.W.1:—

Anderson, Boyes & Co., Ltd.—100-A bolted plug-and-socket coupling with pilot contacts for electrical interlock circuit; 15-h.p. a.c. conveyor motor and starter; 100-A B.S. plug-and-socket connector, alternative cable gland; gate-end circuit-breaker, terminal and cable sealing box variation.

British Jeffery-Diamond, Ltd.—Coal-cutter unit, modified; 5-h.p. d.c. loader motor; air-break, non-reversing starting switches; 5- and 10-h.p. squirrel-cage loader motors with terminal box and additional cable sealing box, or air-break switch in place of terminal box; d.c. and a.c. oil-immersed circuit-breakers; 100-A B.S. plug-and-socket connector with provision for compound filling at rear of plug body.

The British Thomson-Houston Co., Ltd.—Squirrel-cage conveyor motors with alternative cable attachments; t.e.f.c. 10-h.p. squirrel-cage motor; oil-immersed reversing contactor; combined stator and rotor starter with provision for ammeter, and lever instead of crank handle; modified oil-immersed circuit-breakers; air-break gate-end box; oil-immersed combined stator and rotor starter.

The Electric Construction Co., Ltd.—D.c. reversible motor with variations.

The Electrical Apparatus Co., Ltd.—Air-break auto-switch; air-break circuit-breakers with and without isolator and with a.c. or d.c. interiors.

G. Ellison, Ltd.—Air-cooled lighting transformer unit; air-break gate-end circuit-breaker, cast-iron front accommodating earth-leakage relay and ammeter.

W. Francis & Co., Ltd.—Air-break direct-on contactor type starter; air-break gate-end switch panel, hand operated switch interior.

The General Electric Co., Ltd.—Tubular heater, ten alternative lengths from 2 ft. to 15 ft.; well-glass lighting fitting with three-pin plug-in cable sealing boxes incorporating pilot contact, also variation; oil-immersed draw-out circuit-breaker units, single or double meter hoods, and with or without potential transformer chamber; vertical spindle petrol pump motor.

The Globe Engineering Co., Ltd.—0.0312-h.p. squirrel-cage fan motor. (The certificate also covers modifications in other fractional-h.p. motors.)

H. Green & Co., Ltd.—Squirrel-cage and d.c. motors with intermediate terminal plate, terminal box and additional cable sealing box.

Greenwood & Batley, Ltd.—Dynamo and conveyor motor, both with terminal box and additional cable sealing box.

Heyes & Co., Ltd.—60-W well-glass lighting fitting, variation; flit cable connector, two-pin interior; four-way cable coupling box; prismatic lighting fitting for 60/100-W lamps, triple-pole air-break switch fuse, and double- and triple-pole switch fuses, modified.

Lancashire Dynamo & Crypto, Ltd.—"Maxtorq" motor with fabricated mild-steel terminal box; squirrel-cage petrol pump and fan motors.

Laurence, Scott & Electromotors, Ltd. — 40-h.p. d.c. motor; 5-kW combined d.c. dynamo and controller.

M. & C. Switchgear, Ltd.—Air-break remote control switch; two- and four-way disconnecting link boxes, larger and smaller types; modified push-button straight-on starter.

Mather & Platt, Ltd.—Slip-ring units with labyrinth shaft glands.

Mavor & Coulson, Ltd.—20-h.p. d.c. conveyor motor with terminal box and additional cable-sealing box; also type with smaller associated cable-sealing box; coal-cutter motors; squirrel-cage motor, plug-and-socket mounting on motor frame and starter spindle on starter cover.

The Metropolitan-Vickers Electrical Co., Ltd.—Combined stator and rotor starter, with provision for ammeter and lever in place of crank handle, also oil-immersed type air-break gate-end box, variations of cabling arrangement; squirrel-cage conveyor motors, modified; medium size slip-ring unit, labyrinth shaft gland; slip-ring unit, minor modifications; air-break star-delta starter, revised designation; air-break feeder switch, alternative cable attachments, medium-size slip-ring and drill and lighting control units, modified; l.v. lighting transformer unit; smaller and intermediate sized oil-immersed rotor starters; slip-ring units with or without b.l. and s.c. gear; t.e.f.c. slip-ring motors, 40, 70 and 110 h.p., also squirrel-cage type; modified air-break gate-end box.

The Mining Engineering Co., Ltd.—D.c., squirrel-cage and petrol pump motors.

The Morley Electrical Engineering Co., Ltd.—Combined conveyor motor and starter providing for alternative starter mountings and cable attachments; d.c. and a.c. air-break reversing drum controllers with integral terminal box and additional cable sealing boxes; squirrel-cage induction motor, variation.

Nalder Bros. & Thompson, Ltd.—Electro-magnetic protective relay, minor modification.

The Revo Electric Co., Ltd.—Variation of lighting fittings by use of cable junction box and alternative designation for fitting with conduit entry; well-glass fitting for 60-W lamps.

Siemens-Schuckert (Great Britain), Ltd.—Air-break conveyor, coal-cutter and drill transformer panels.

Switchgear & Cowans, Ltd.—Oil-immersed lighting transformers, 2, 3-5 and 5 kVA, 3,300 V; draw-out oil-immersed gate-end switch; variation of air-break gate-end starter by provision of current transformer chamber with ammeter on the bus-bar enclosure; draw-out pillar-type switchgear with earthing arrangement.

Veritys, Ltd.—0.25-h.p. fan motor with integral terminal box having conduit entry.

Vlasto, Clark & Watson.—Increased ratings of types "SR" and "S.C." oil-immersed controllers.

The Wallacetown Engineering Co.—100-A B.S. plug-and-socket connector.

Allen West & Co., Ltd.—Controller instrument with moving-iron ammeter or voltmeter movements.

Wright Electric Motors (Halifax), Ltd.—Single drum type 12-, 17- and 20-in. haulage motor and switch units comprising squirrel-cage motor with air-break reversing switch on the motor end-cover.

New Books

Patents for Inventions. (Second Edition.) By J. EWART WALKER, B.A., and JERVIS ROSCOE, B.Sc. Pp. 243. London: Sir Isaac Pitman & Sons, Ltd. Price 15s. net.

In the second edition the authors of this volume have followed closely the form of the first edition, and the chapters and headings remain unchanged. The book has, however, been revised throughout in view of the Patents and Designs Acts as amended in 1932, and in the light of the many decisions of the High Court and the Comptroller-General affecting the interpretation of the law and its practice since the previous edition. As a result the table of reported cases referred to in the text now contains over 600 references, and will be appreciated by the profession as providing a list including those most recently decided. As before, these cases are listed in alphabetical order and numbered. In the text they are referred to by number alone, and this results in a compactness not associated with those legal books in which references are inserted in the text itself or at the foot of each page.

The book has been written so as to be intelligible to the layman, and with this in mind the chapters have been arranged so as to follow the course of patents through application, opposition, construction of the specification, and validity, to the rights and liabilities of the patentee. Logical as this arrangement may be, it is open to the criticism that the layman may be led to believe that subject-matter, and in particular the quantum of inventive ingenuity required for validity, is not a question for consideration during the application stage of a patent.

In the appendices are reprinted the Statute of Monopolies, the Patents & Designs Acts, 1907-1932, Patents Rules, 1932, and the Patents Appeal Tribunal Rules, 1932. There is also an index which successfully passed our checking.

Electricity. By W. L. BRAGG, Sc.D. Pp. 286; figs. 138. London: G. Bell & Sons, Ltd. Price 8s. 6d. net.

It is not difficult to interest the young in science if it is properly taught, and we believe that this book will do more than make the path easy; it will arouse a real interest in a study of the applications of electricity and prepare the way for a more intensive study of other branches of science. In Dr. Bragg we have a great experimenter, an able exponent of the fundamental ideas of electricity and one particularly gifted as a lecturer. Those who heard his Royal Institution lectures to the young at Christmas, 1934, remember how extraordinarily lucid and simple were his discourses, and how well illustrated they were by most elaborate and spectacular experiments.

The present publication comprises the substance of those six lectures. The first three chapters are devoted to a general survey of the subject, including the principles of electricity and magnetism. After a short account of electrical charges, lines of force and machines utilised in producing electrical charges, the author discusses heating effects, electrolytic conduction, magnetism, the electric motor and the dynamo, the whole being characterised by a cultured breadth of vision based on natural laws.

The last three sections of the volume are devoted to a discussion of electrical transmission, the use of electric power, the application of electric currents in conveying messages, a description of some properties of high-frequency currents and an account of the principles of the oscillating electrical circuits on which wireless technique is based. An interesting section deals with waves of many kinds, making clear the meaning of the miracle that is now becoming a commonplace.

Many readers, no longer juveniles, will find this volume a valuable aid in the understanding of natural laws.

Cinema Electrical Equipment

COLOUR floodlighting by means of 400-W "Osira" lamps installed in specially designed units draws attention to the General Electric Co.'s stand at the exhibition which the Cinematograph Exhibitors' Association is holding at Eastbourne this week. There is a comprehensive range of "Osram" lamps and a special display of architectural types, carbons and "Claudgen" neon lighting also being well represented. The Edison Swan Electric Co.'s architectural lamps in the form of letters are an innovation which should prove of great interest to cinema proprietors. This company's stationary battery equipment for emergency lighting and sound apparatus is the result of more than a quarter of a century's experience, while the "Tungar" battery charging equipment has been well known for many years. Westinghouse metal rectifiers for supplying power for operating cinematograph projector arcs, &c., are to be seen for the first time, and the applications of metal rectifiers to various other uses in the cinema are also demonstrated, including the supplying of d.c. to magnetic control valves for heating and ventilating systems, charging of lamp batteries, and also a special new form of equipment for emergency lighting, &c.

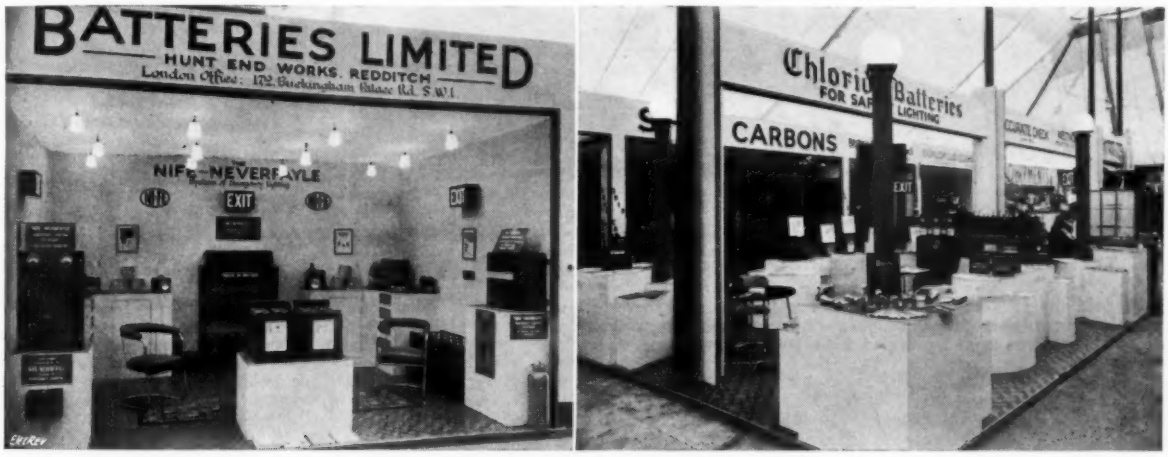
Emergency lighting installations are also shown on the stand of Batteries, Ltd., whose main exhibit consists of two complete "Nife Neverfayle" equipments, one of which is a miniature of that installed at the Shakespeare Memorial Theatre. Various types of portable lighting sets and handlamps are also shown by this company. The Chloride Electrical Storage Co., Ltd., demonstrates its floating battery system and has a selection of "Exide" batteries (fitted with charge indicating devices) and "Drydex" torches. An entirely new type of mercury-arc rectifier for operating projectors is introduced on the stand of the recently formed Nevelin Electric Co., Ltd.

The colour lighting effects of a miniature stage and also a model Wurlitzer organ with illuminated ends are controlled by the Holophane "Auto-Selective" system, for which improved dials have still further simplified the art of colour mixing. The Holophane exhibit also includes demonstrations of the new "Moulded Contour" system of auditorium illumination. What is called the "Mug's" (foolproof) switchboard controls the colour lighting of a stage set out on the Strand Electric and Engineering Co.'s stand, where a new type of reflecting letter is also to be seen.

Modern methods of cinema illumination are a speciality of Messrs. F. H. Pride, who have combined their exhibit with that of Compton Organs. The "Compton Electrone" instrument, which incorporates a Watkins and Watson silent electric lift, produces all its acoustical effects electrically.

Fireproof spoolboxes, hot cathode type rectifiers, projecting equipment, "Mazda" tubular lamps and a luminous fountain are a few of the B.T.H. products shown by the marketing organisation, the Sound and Cinema Equipment, Ltd. This company also has two novelties manufactured by the Mechanical Informator (1933), Ltd.—the "Stillograph" automatic programme announcer and the "Attaglance" electric programme indicator clock. Ship Carbons show a comprehensive range of carbons. All types of theatre electrical equipment, including curtain controls, organ and orchestra lifts, switchboards, and dimmer banks are manufactured and installed by Messrs. W. J. Furse & Co., Ltd. Among a number of display novelties shown by Messrs. Leon Goodman Displays, Ltd., are a running neon sign (incorporating a neon tube with a message on cloth passing in front of it), flicker neon lamps and an inexpensive two-colour lamp. The last-mentioned has two filaments and the top and bottom halves of the glass are sprayed in different colours, a flasher being concealed in the cap.

Practical demonstrations of acoustically treated ventilating ducts are given by Newalls Insulation Co. Pathé Equipment, Ltd., are showing projectors, while other exhibitors who are using their stands purely to "establish contacts" are the Western Electric Co., Ltd.; British Talking Pictures, Ltd.; and G.B. Equipments, Ltd. The exhibition closes to-day (Friday).



Two of the battery and emergency lighting equipment manufacturers' stands at the Cinematograph Exhibitors' Association Exhibition now being held at the Winter Garden, Eastbourne. The stand of Ship Carbons can be seen in the background of the right-hand picture

Parliamentary News

(BY OUR SPECIAL REPORTER)

THE Grimsby Corporation (Trolley Vehicles) Bill was considered on June 18th by the Select Committee of the House of Commons on Unopposed Bills, Capt. R. C. Bourne (Oxford, U.) presiding.

It is proposed by the Grimsby Corporation to extend the present trolley vehicle routes in order to provide more convenient turning points. Originally there were objections from frontagers and from an outside local authority whose boundary divides the road along which the trolley vehicles run, but the latter withdrew its opposition and the frontagers' objections were overruled by the Ministry of Transport on the ground that it was really a matter between the Corporation and the ratepayers, and it was the policy of the Corporation to provide passenger transport by means of trolley vehicles. The Committee approved the Bill and ordered it to be reported for third reading.

Supply to a Gloucester Village

On June 18th Mr. Perkins asked the Minister of Transport what progress, if any, had been made in supplying the village of Sheepscombe, Glos., with electricity.

Mr. Hore-Belisha said he was informed that estimates of the cost of extending a supply to Sheepscombe had now been prepared and were under consideration by the West Gloucestershire Power Company. He had asked the Electricity Commissioners to keep in touch with the company.

A Passing-off Action

In the Chancery Division on June 19th Mr. Justice Farwell had before him the action by Impex Electrical, Ltd., against Mr. Maurice Hyman, who traded under the name of the Impex Radio & Electrical Co. at Falcon Square Aldersgate, E.C., on a motion by the plaintiffs for an interlocutory injunction restraining the defendant from passing-off his goods as those of the plaintiffs.

Mr. Buckmaster, in support of the motion, stated that Mr. Hayes, who represented the defendant, had agreed to treat the motion as the trial of the action and to submit to an injunction in the terms of the notice of motion and to pay the plaintiffs' costs of the action. The plaintiffs did not ask for damages.

His Lordship assented to the terms as agreed and stated by counsel.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Higher Wages for Engineering Workers

It was announced last week that as the result of the prolonged negotiations between the Engineering and Allied Employers' Federation and the engineering trade unions the wages of employés in the engineering industry were to be increased. The "war bonus" paid to adult male workers is to be raised by three shillings a week in three equal stages: at the end of this month, at the end of September, and at the end of December. Night-shift rates are also to be increased to 20 per cent. above day rates. The first two hours of overtime are to be paid for at the rate of time and one-third, and thereafter the rate will be time and a half. The negotiations regarding local rates are to be continued for a period of six months, and the setting-up of machinery for dealing with such questions is to be the subject of further discussion between the employers and the trade unions.

The increases were considered at a national conference of the Amalgamated Engineering Union on Friday last week when a resolution was passed "viewing with grave concern" their inadequacy and calling upon the executive of the union to lodge a demand for the full restoration of the conditions existing prior to June, 1931, and a minimum increase of 3d. an hour in the basic rates. During the discussion the executive was criticised and it was said that there was widespread discontent among the membership. Mr. J. Kaylor, a member of the executive, said that the great majority of the members had suffered through the insistence upon unskilled men having the same wage increase as skilled men.

The Electro Dynamic Construction Co.'s new factory at St. Mary Cray

Fire at Ferranti Radio Works

Referring to the fire which broke out at their Moston Radio Works on June 14th, Messrs. Ferranti, Ltd., inform us that the section of the works devoted to repairs and servicing, packing and dispatching was completely destroyed. Happily, however, the flames were prevented from spreading to any other section of the works, and normal production will not be interfered with. The cause of the fire is as yet unknown, but the company is confident that it had no electrical origin, since the main switch controlling the supply to that section of the works was open. Rebuilding will be proceeded with at once, and the fire will cause no unemployment.

Control of Japanese Electrical Industry

A *Reuter* message from Tokio says that it is reported that the Japanese Government is formulating a plan to control the electric power industry through a company with a capital of a milliard and a half yen (approximately £58,000,000).

Islington's New Electricity Offices

The Islington Borough Council Electricity Committee has approved an estimate of £6,000 for furnishing and equipping the new electricity offices and showrooms.

Employment in May

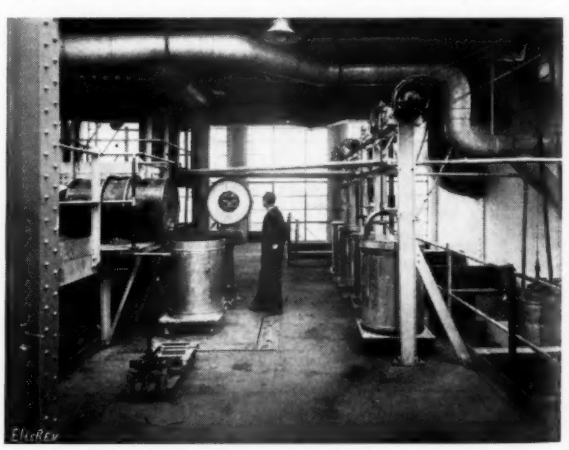
Employment during May in the engineering industry improved generally, and in some sections, including electrical engineering, it was good. Compared with a year ago employment was considerably better in all the principal sections of the industry and in all administrative divisions. The *Ministry of Labour Gazette* states that the number of unemployed in the engineering industry as a whole decreased by 7,256 to 77,520 and the percentage from 8.6 to 7.9 (12.4 per cent. in May, 1935). In the electrical engineering section the number of unemployed was 4,213 or 4.5 per cent., as against 4.9 per cent. in April and 6.9 per cent. in May, 1935. The unemployed in the electrical wiring and contracting industry numbered 4,432, the proportion falling from 12.6 to 12.5 per cent. (14.7 per cent. in May, 1935). In the electric cable, apparatus and lamps, &c., groups the number of unemployed was 10,341, the proportion decreasing from 8.2 to 7.3 per cent. (9.4 per cent. in May, 1935).

A New Electric Motor and Generator Factory

A few days ago we visited the new factory of the Electro Dynamic Construction Co., Ltd., at St. Mary Cray, Kent. The factory proper, which is light and airy, is a one-storey building extending over an area of 26,000 sq. ft., and an additional 4 acres of adjoining ground have been acquired to provide for future expansion. The company specialises in the manufacture of electric motors and generators of from 1/10 h.p. to 200 kW, and among some of the interesting items seen in course of production were cinematograph projector motors; ¼-h.p., 18,000 r.p.m. motors for television; motor-generators for aircraft radio; rotary convertors for neon signs; aluminium-constructed motors (one-third of the weight of the ordinary type); water-cooled submersible motors for use on ships; and a novel type of 50-h.p. variable-speed three-phase motor, with a 4 to 1 speed ratio, for operating a cement works ropeway. A large number of motors and generators are made for the Admiralty, Army, Air Ministry and Post Office, and the company supplies a large proportion of the small rotary convertors required for radio sets. Last year the company's output amounted to almost 10,000 articles and the improved facilities now available will permit both an increase in the production of existing lines and the development of new ones, among the first of which will be a range of capacitor motors. Approximately ninety per cent. of the three hundred staff consists of men and boys, girls being employed for making small armature windings, &c. The front portion of the building has two floors, the lower being utilised for stores and that above for general and drawing offices.

Enamels for Industrial Use

To produce cellulose lacquers, enamels and wood finishes solely for industrial requirements the Frederick Crane Chemical Co., Ltd., has just opened a new factory, having nearly 75,000 sq. ft. of factory flooring and 10,000 sq. ft. of office space, in Alma Street, Smethwick. The premises combine three main buildings: the office block, the thinners and solvent plant and the main factory, and several smaller buildings such as the raw material stores, special mixing buildings, power house and laboratories. At present the main factory is virtually a single-storey building, although manufacture is arranged at different levels, but arrangements have been made for extension by adding an extra storey without any disturbance to the existing building. The fact that a large proportion of the company's products contain inflammable material has necessitated strict precautions against fire. The buildings



The base solution manufacturing department at the Frederick Crane Chemical Co.'s new works

themselves and the general equipment used are of fire-resisting materials, and various sections of the factory are arranged to be automatically shut off by fireproof doors. All the tanks, &c., are earthed in order to minimise trouble due to static discharges of electricity, and the totally enclosed lighting fittings (made by Walsall Conduits, Ltd.) and electric motors (Laurence Scott) bear Buxton explosion test certificates. The switchgear (Ellison) is arranged outside the main buildings. The main distribution board was supplied by Messrs. Parmiter, Hope and Sugden, Ltd. Throughout the various processes of manufacture laboratory tests ensure that an enamel or lacquer will be entirely satisfactory for its particular purpose. A special department, the services of which are always available to customers, deals solely with the development of new processes of manufacture, the use of new raw materials, the production of new and interesting products, and new methods of application.

Wages in the Cable Making Industry

The Joint Industrial Council for the Electrical Cable Making Industry announces that there will be no cost-of-living alteration in wages on the third pay-day in July.

A Bracket Box

Referring to our last week's description of their bracket box, Seal Electric, Ltd., ask us to state that it is a registered design (No. 30641).

For Sale

The London and Home Counties J.E.A. has for disposal d.c meters.

The Kettering U.D.C. offers two "Weir" pumps for sale. (See our classified advertisements.)

Registered Electrical Contractors

In the list of applications for registration accepted by the Executive Committee of the National Register of Electrical Installation Contractors published in our last issue, the name of T. Stanley was given. This should have read Stanley E. Thomas, 1068, London Road, Thornton Heath. The address of Mr. N. Moore, another contractor mentioned, is Padiham. *nr. Burnley*, not Bromley as stated.

A Cinema Installation

The equipment installed at the Picture House, Thurso, is one of the latest extended frequency range models, with a range between 50 and 10,000 cycles. Duplicate amplifiers of 11 watts undistorted output each are installed, with two B.T.H. R.K. speakers with special horns. The whole of the equipment is mains operated by a small motor generator set consisting of an a.c. motor and two d.c. generators, one at 110 V d.c. for the supply of the speaker fields and the other 12 V d.c. for the exciter lamps. The amplifiers and the two projector motors are fed direct from the a.c. supply. The soundheads are fitted with the latest optical system, with exciter lamps running at 12 V 7.5 A. The projector lanterns are straight arc B.T.H. lamps, incorporating a 10-in. mirror. The supply for these lamps (25 A each at 40 V), comes from a B.T.H. rectifier of the three-bulb mercury vapour hot cathode type. The equipment itself consists of an air-cooled double wound transformer and three type BD.12 rectifier valves. Two of the bulbs will carry the full load without damage until it is possible to replace the one which has failed. The whole of the electrical installation was carried out by Public Utilities (Electric), Ltd., under the direction of Mr. W. Whitchurch Howell, the company's representative at Thurso.

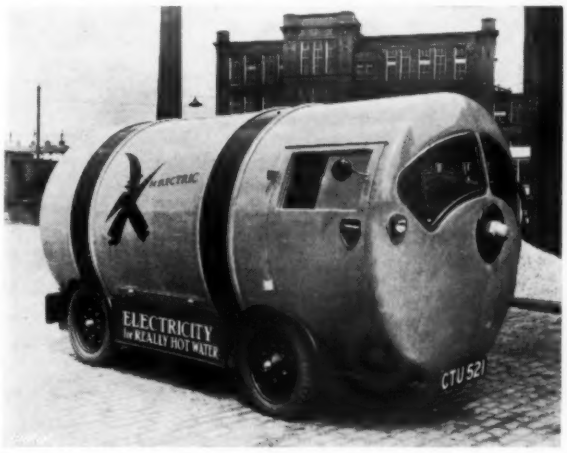
The auditorium of the Picture House, Thurso

New Building Materials Showrooms

Tiling, stoneware, piping, concrete building blocks, firebricks and refractories, and many other articles used extensively by both electrical manufacturers and contractors, are now to be seen in large new showrooms just opened by Messrs. J. H. Sankey & Son, Ltd., at Aldwych House, London, W.C.2. A feature is made of tiled surrounds incorporating electric fires and Smith's electric clocks, while in the bathroom section are several attractive totally or semi-recessed cabinets with illuminated glass panels each side. Specimens are also on view of the "Cranham" covering composition, which is now being largely used for covering high- and low-pressure pipes, tanks, boilers, &c., for the conservation of heat: it is claimed to have an efficiency of 94 per cent. at 1,000 deg. F. "C-Sound" acoustic plaster, "Sisalkraft" building paper, "Vitrolite" wall lining and "Philplug" plastic plugging are other items of particular interest.

An Electric Delivery Van

The accompanying illustration, sent us by Mr. J. Harwood Lumsden, chief engineer of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board, shows a new auto electric delivery van which the Board has recently purchased. The body is in the shape of a storage heater and Mr. Lumsden states that it has aroused much interest in the area. He thinks it will prove of great value for propaganda purposes.



The new delivery van of the Stalybridge Tramways and Electricity Board

Queen's Hall Battery

The D. P. Battery Co., Ltd., has received instructions from Messrs. Chappell & Co., Ltd., to replate the emergency lighting battery in Queen's Hall, London.

Price Reduction

Astralite Electrical Products inform us that, following upon the installation of their own presses, they have made a substantial reduction in the price of their bakelite festoon holders and have increased discounts.

A Refrigerator Demonstration at Ealing

A "cold cookery" demonstration was held at the Ealing Town Hall on Tuesday and Wednesday last under the auspices of the Ealing Electricity Department by arrangement with the makers of the "H.M.V." electric refrigerator. The demonstration included the showing of E.D.A. talking films, gramophone recitals and a free prize competition.

Royal Norfolk Show

An outstanding attraction at the Royal Norfolk Agricultural Show at Norwich last week was the stand of the Norwich Corporation Electricity Department, which serves not only its own city but a large part of the county. Prominence was given to water heating and practical displays attracted very large attendances. Messrs. Mann, Egerton & Co., Ltd., had a wide range of apparatus on view on another stand. Dairykeepers were keenly interested in the refrigerators exhibited.

Advertisement Correction

We are asked to state that an error occurred in the advertisement of Messrs. Eastwoods, Ltd., in our June 12th issue (Supplement, page 84). The consumption of the "Sparton" refrigerator is 4 units per week, not per *day*.

Change of Address

The East Anglian Electric Supply Co., Ltd., has moved its head office to Finborough Hall, Stowmarket.

Prices of Materials

Messrs. Henry Gardner & Co., Ltd., report, June 4th: No change in the price of copper bars (best selected), sheet and rod and English pig lead. Spelter, £13 17s. 6d., 2s. 6d. inc. English block tin, £184 15s., £3 5s. inc.

Messrs. Edward Till & Co. report, June 24th: India rubber, Para fine, 9¼d., ¼d. inc.

Hot Time for a Refrigerator

A novel refrigerator demonstration is being given at Messrs. Selfridge's by Searsint, Ltd. A specially heated glass room has been prepared, the temperature of which is kept constant at 105 deg. F. In this heated room stands a "Coldspot" refrigerator fitted with a glass front so that the thermometer placed inside the cabinet can be read by the public. In practice this registers under 50 deg. Standing near the refrigerator

is a quantity of butter reduced to liquid form owing to the high temperature of the room and running from one vessel to another. A little way away in a compressor unit ice is in the process of formation. The public is at liberty to enter the room, check the readings of the two thermometers, one inside the cabinet and the other in the room, and feel for themselves the cold top of the cabinet. Except for the glass front, the refrigerator is a standard model.

A Croydon Carnival Award

The first prize of a silver cup for the best advertising display van at a carnival recently held at Croydon was awarded to a vehicle prepared by the Corporation Electricity Department to illustrate the advantages of electric refrigeration. Incorporated in the display were large imitation coins, pointing out that a refrigerator cost only half a crown a week to buy and a penny a day to run.

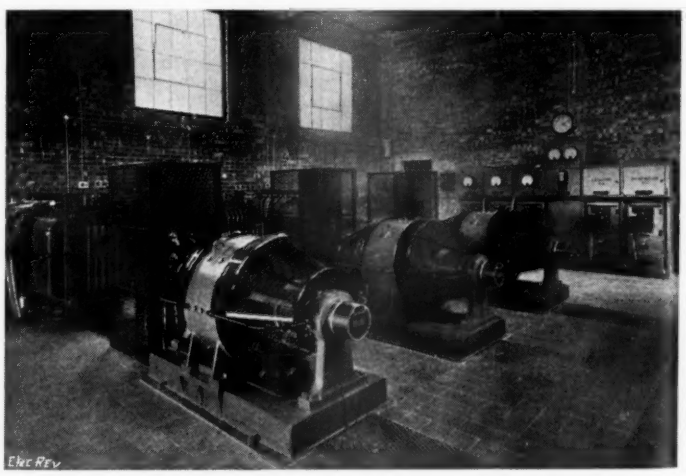
The Croydon Electricity Department's refrigerator display vehicle which won a first prize at a local Carnival

Annual Holidays

Messrs. Bruce Peebles & Co., Ltd., announce that in connection with the Edinburgh Trades Holiday their works will be closed from July 10th to 20th, during which period no goods will be received or despatched.

Electrical Plant at the Aldershot Tattoo

A considerable amount of electrical equipment was used at the recent Aldershot Tattoo. That utilised for supplying the electricity to the searchlights used for illuminating the arena was supplied by the Brush Electrical Engineering Co., Ltd. The plant consists of three rotary convertors, each with an output of 174 kW at 170/85 V, 1,020 A continuous, and designed to carry a 25 per cent. overload for two hours or 50 per cent. for fifteen minutes, high voltage switchboards, transformers, starting panels, and a d.c. switchboard. The a.c. supply is 6,600 V, three phase. The high-voltage switchboard is of the totally enclosed drop-down draw-out metal-clad type and consists of six panels. The 190-kVA step-down transformers are 3/6 phase, oil immersed, natural self-cooled core type, wound for a ratio of 6,600/124 V on no load with tappings on the high-voltage side.. The rotary convertors have automatic centrifugal switches and will run in parallel under all conditions of load and overload. The searchlights are connected across the outer and mid-wire connections of the three-wire circuit, and in consequence when the arc is struck a heavy out of balance current flows momentarily in the convertor, but there is no appreciable variation of voltage. The chief engineer of the Tattoo is Capt. A. J. Mayne.



The electrical plant for the Aldershot Tattoo, showing the convertors in the foreground

Annual Exide Convention

Delegates from all over the country and from overseas attended the sixteenth annual Exide Convention held at Harrogate from June 17th to 20th. Business sessions occupied the mornings, and among the recreations arranged for the afternoons were competitions for the Exide golf challenge cup and other golfing trophies, a motor coach tour to Harewood, the home of H.R.H. the Princess Royal, and to Ripon and Fountains Abbey. Welcoming the delegates on the opening day the Mayor of Harrogate, Councillor S. Cartwright, said that the Exide organisation had built up a good reputation through a good product and sound advertising. Mr. D. P. Dunne was chairman of the convention.

A Uniform Van Design

The Hotpoint Electric Appliance Co., Ltd., informs us that the design on all its delivery and service vans has recently been standardised to accord with the general design of cartons used by the company. The design consists of red and black wording on a cream ground with black and white check border. Due prominence is naturally given to the little Hotpoint red man. The company's Bradford office entered four vans in the recent Bradford Hospital procession and were awarded a prize.

Machining " Tufnol "

In the notice relating to the publication " Hints on Machining Tufnol " in our last issue, we incorrectly stated that it was a publication of Messrs. George Ellison, Ltd., whereas it is published by Ellison Insulations, Ltd.

Trade Announcements

The recently formed La Mont Steam Generator, Ltd., has acquired the patent rights for the La Mont boiler for this country and the British Empire, and has made arrangements for its manufacture within this territory. In this boiler the circulation is forced and controlled, and the installations at work or in course of construction include boilers with capacities of 100 tons per hour and working pressures up to 1,500 lb. per sq. in.

I.A.C., Ltd. (Isenthal Automatic Controls) has recently been formed with offices at 88, Chase Road, North Acton, N.W.10, to take over the manufacture and sale of mercury switches hitherto carried on by Messrs. Isenthal & Co., Ltd., in order to cope with the increasing demand for these switches. We have received from the new company an illustrated and descriptive list (No. 1636) of mercury switches.

Messrs. J. B. Rudkin & Co., Ltd., inform us that their business has been amalgamated with that of Messrs. Cary, Hallewell & Co., Ltd., and on and after July 1st will be carried on under the name of Rudkin, Hallewell, Ltd. On that date the business will be removed to a new factory, New Era Works, Purley Way, Croydon. (Telephone: Thornton Heath 2480.) Mr. Rudkin is managing director of the new company.

Higgs Motors, Ltd., announce that, owing to the continued advance in manufacturing costs, it has been necessary to reduce the list discount on all goods, including control gear, from 20 per cent. and 10 per cent. to 15 per cent. and 10 per cent. Any preferential discount will remain as before.

The Hobart Manufacturing Co., Ltd., has moved its head office to its works at Hobart Corner, New Southgate, N.11 (telephone: Palmers Green 1211). New West-End showrooms have been opened at 63-65, New Oxford Street, London, W.C.1.

Archibald Low Electrics, Ltd., announces the following changes of addresses of the company's branches:—Glasgow, 95, Waterloo Street; Manchester, 30, Albert Street; and London, Evelyn House, 62, Oxford Street, W.1.

Messrs. Fraser & Howard, Ltd., have removed to 49, Rathbone Street, W.1 (telephone: Museum 0802).

Messrs. Brown Bros., Ltd., are extending their headquarters at Great Eastern Street, E.C.2.

The Midland Electric Installation Co., Ltd., Wolverhampton, asks us to state that it is in no way connected with the Midland Electrical Installations, of Nottingham, whose bankruptcy has recently been recorded in the ELECTRICAL REVIEW.

Social Events

On Saturday last a fête was held at its ground by the Dagenham Cables Sports Club. This club is the sports organisation of the Union Cable Co., Ltd., and Southern United Telephone Cables, Ltd. Nearly 4,000 people attended and about sixty events were held. The proceedings started by the opening of the children's playground by Mrs. J. Snow Huddleston. This playground has been well equipped by the help of friends of the club, as well as by the funds obtained through various functions. There were three separate displays given by the Dagenham Girl Pipers, who also headed a procession to the ground which included an " Old Crocks " cycle parade. Another part of the entertainment was the exhibition of the

"Flying Flea" by the Ultra Light Aero Club, Romford, and a plane which gave various demonstrations. Amongst those present were Mr. J. Snow Huddleston, the president of the club, and Messrs. A. C. Attwood, H. Bailey, A. Baxter, A. Battley, T. Burr, F. J. Collins, W. Gee, H. G. Goodwin, S. J. Harold, G. R. Hearn, F. W. Johns, H. P. Jarvis, A. T. C. Moore, S. G. Meadows, A. P. Pope, J. S. Scougall, L. A. Thomson, W. P. Whitehouse and G. Ware.

A special train left Kew Bridge on June 20th bearing over 500 members of Tecalemit works and sales force to Brighton for their annual outing. An overflow of about 100 travelled by electric train, there being an increase in attendance this year of over 250. At luncheon, in the absence of Mr. A. Leonard (chairman), Mr. R. A. Chalmers (managing director) presided and read telegraphed greetings from the former and also from Mr. S. Gates, another director.

The "Clesco" Sports and Social Club (County of London Electric Supply Co., Ltd. and its associated companies) will hold its tenth annual sports meeting at its sports ground, Grand Drive, Raynes Park, to-morrow (Saturday). The prizes will be presented by Mrs. Brand, wife of Mr. C. J. Brand, a director of the company. There will also be dancing and a non-stop variety show in the pavilion.

On Wednesday last week the Woking Electric Supply Co., Ltd., held its annual works outing at Hastings, where a party of 165 employés spent a pleasant day.

A St. Helens Carnival Award

A motor vehicle carrying a display of the products of Messrs. Thomas Bolton & Sons, Ltd., was awarded a prize at a hospital carnival procession held recently at St. Helens, Lancs.

The prize-winning vehicle of Messrs. Thomas Bolton & Sons, Ltd., in the hospital carnival procession at St. Helens

The articles displayed included many with electrical uses, such as high conductivity copper and brass rings, tubes, sections and sheet, copper rings and stampings, and cadmium-copper trolley wire.

New Catalogues and Lists

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—New pamphlets dealing with plug and switch units, metal-clad power fuse distribution boxes, the "Reymez" pedestal wash basin, domestic electric water heaters, the "Earthometer" and "Class L" induction motors, and a reprint of a paper of the International Conference on Large High-voltage Electric Systems, by Mr. B. H. Leeson, dealing with the centralised co-ordination of manual automatic and remote control of generating stations, distributing networks and consumers' circuits.

Cambridge Instrument Co., Ltd., 45, Grosvenor Place, London, S.W.1.—Details, including a facsimile of an actual record, of a temperature and humidity recorder.

Constructors, Ltd., Nickel Works, Tyburn Road, Erdington, Birmingham.—A catalogue of cycle parts for factories, blocks of offices, &c.

Rawlplug Company, Ltd., Cromwell Road, London, S.W.7.—Details of a new type of soldering iron.

Wright Electric Motors (Halifax), Ltd., Century Works, Pellon Lane, Halifax.—A leaflet illustrating a frequency changer.

L. E. Wilson & Co., Ltd., Hodson's Court, Corporation Street, Manchester, 4.—A leaflet drawing attention to the company's electrical contracting activities.

M.K. Electric, Ltd., Wakefield Street, Edmonton, London, N.18.—A pamphlet describing and illustrating "Anti-flash" screened sockets.

Higgs Motors, Ltd., Birmingham, 6.—Catalogue sections dealing with small electric tools, small battery-charging sets, and totally enclosed induction motors.

Bankruptcy Proceedings

M. Goldenberg, 80, Wargrave Avenue, London, N.15, lately 464, Kingsland Road, E.8, company director.—The first meeting of creditors was held on June 19th at 29, Russell Square, London, W.C., when the statement of affairs showed gross liabilities of £3,535, of which £1,773 was expected to rank for dividend, with assets of £33, leaving a deficiency of £1,740. In April, 1934, the debtor promoted a company known as International Electric Supplies Co., Ltd., with a nominal capital of £2,000, which was subsequently increased to £3,000. The debtor had guaranteed certain accounts on behalf of the company, including the bank overdraft, and from time to time he had borrowed money from a moneylender which he advanced to the company to pay pressing creditors. The company was not a success and went into voluntary liquidation in December, 1935. The debtor attributed his failure to liability under his guarantees. The case being a summary one was left in the hands of the Official Receiver.

J. E. Donley, electrical contractor, carrying on business as "J. E. D. Installations," 67, Stracey Road, Forest Gate, E.—The public examination was held on June 17th at the London Bankruptcy Court, the accounts showing liabilities of £180 and assets of £25. Debtor stated that he began the business in September, 1932, and paid his way until October, 1933, when he incurred a bad debt of £254 through the failure of a company with which he had a contract for electrical work on a housing estate at Horsham. Thereafter he continued to trade in the hope of recovering his financial position, but as this did not materialise he filed his petition. The examination was concluded.

J. S. W. Bartley, company director, 6, Sydney Place, S.W.—An application was made on June 17th to Mr. Registrar Kean at the London Bankruptcy Court for an order of discharge on behalf of this debtor who failed in January last. The Official Receiver reported that the ranking liabilities amounted to £10,613; the assets had so far realised £1,659, a further £100 was expected to be recovered, and Mr. A. G. Warne, the trustee, would pay a dividend of 2s. 8d. in the £. The applicant, an electrical engineer, attributed his insolvency to the failure of two companies which he had formed and to his liability for guarantees given on their behalf. The discharge was suspended for six months.

Rebecca A. Robinson, radio and electrical engineer, 287, Upper Street, Islington, and formerly of 61, Holloway Road, N., trading as the Highbury Engineering Works.—An application was made on June 16th to Mr. Registrar Parton at the London Bankruptcy Court for an order of discharge on behalf of this debtor who failed in February last with debts £528 and assets which have realised £116. The discharge was suspended for six months.

W. Howson, radio dealer, 7, Olton Street, Wavertree, Liverpool, formerly trading in co-partnership with another and lately trading alone as the Marivox Radio Service Co. at 80, Derby Lane, Liverpool.—First and final dividend of 2s. 8d. in the £, payable June 24th at the Official Receiver's offices, Government Buildings, Victoria Street, Liverpool.

G. F. Kennedy, electrical engineer, trading as Kennedy & Co., Market Square, Shepton Mallet, Somerset.—First and final dividend of 1s. 1½d. in the £, payable June 19th at the Official Receiver's office, 26, Baldwin Street, Bristol.

D. A. Bolton, electrical contractor, Palace Chambers, Bridge Street, Westminster, S.W.—First and final dividend of 3s. 9d. in the £, payable at Bankruptcy Buildings, Carey Street, W.C.

N. Ellis (Oxenhope Radio Stores), wireless dealer, Station Road, Oxenhope, and 20, New Road, Denholme.—Last day for receiving proofs for dividend July 4th. Trustee, Mr. W. F. Cresswell, 71, Manningham Lane, Bradford, Official Receiver.

A. Boards, radio dealer, 253, Barlow Moor Road, Chorlton-cum-Hardy, Manchester.—First meeting June 26th at 20, Byrom Street, Manchester. Public examination July 10th at the Court House, Manchester.

Company Liquidations

N.R.S., Ltd., radio engineers, Natrasco Works, Cobbold Road, Willesden Green, London, N.W.—The adjourned meeting of creditors was held recently at the company's registered offices. It was stated that certain negotiations which had been in progress since the first meeting had now fallen through, and the company could not make any suggestion for the payment of a dividend to the creditors. In order to meet the wishes of the unsecured trade creditors the shareholders and cash creditors had agreed that an independent liquidator should be appointed to act with the liquidator nominated by the company, so that the position could be thoroughly investigated. At the previous meeting the statement of affairs showed ranking liabilities of £6,798, against net assets of £3,740, leaving a deficiency of £3,058. It was resolved that Mr. Leslie Webber, C.A., of Messrs. Percy Mason & Co., and Mr. Babbage, the liquidator nominated by the company, should be the joint liquidators. A committee of inspection consisting of the representatives of three of the principal creditors was also appointed.

Jones Bros. (Blackpool), Ltd., 1, Birley Street, Blackpool, electrical engineers.—A statement of affairs was presented at the recent statutory meeting, showing ranking liabilities of £1,765 and contingent liabilities of £83, which were not expected to rank. The net assets were £1,223, leaving a deficiency, so far as the creditors were concerned, of £542. The issued capital of the company was £3,070, and as regarded the shareholders there was a deficiency of £3,612. The company was registered in 1928, and following a small net profit losses were incurred in subsequent years. A resolution was passed confirming the voluntary liquidation of the company, with Mr. A. T. Eaves, 47, Mosley Street, Manchester, as liquidator, with a committee. Particulars of claims to the liquidator by July 31st.

P. R. T. Corporation, Ltd., (formerly Philco Radio & Television Corporation of Great Britain, Ltd.).—Winding up voluntarily. Liquidator, Mr. T. F. Williams, Wadsworth Road, Perivale, Middlesex. The company is to be reconstructed and the assets sold to the Philco Radio & Television Corporation of Great Britain, Ltd., the registration of which was recorded in our last issue.

A. Vandam & Co. (1933), Ltd.—At a meeting of members on June 16th Mr. F. W. Paterson, 35, Great Tower Street, London, E.C.3, was appointed liquidator in the voluntary winding-up of this company, and his appointment was subsequently confirmed by the creditors. A statement of affairs as at June 4th shows a deficiency as regards the creditors of £2,495 and the company's issued capital is £3,336, making a total deficiency of £5,831.

Home Electric, Ltd.—Liquidator, Mr. H. A. Snelling, Columbia House, Aldwych, W.C., released May 3rd.

Bowyer-Lowe Co., Ltd.—Liquidator, Mr. F. E. Bendall, 4, Charterhouse Square, E.C., released January 27th.

Electricity Supply

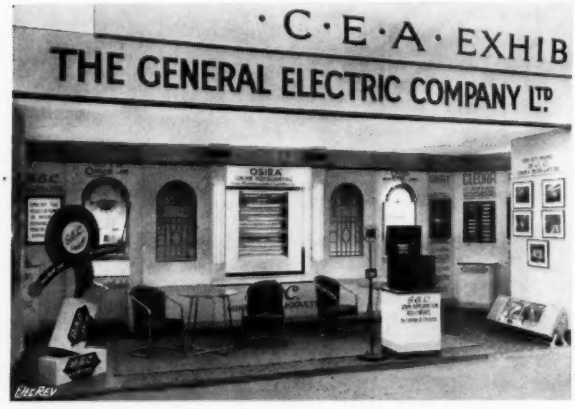
Lighting, Domestic, Power

Barking.—DEPARTMENT'S ACTIVITIES.—Exemplifying the electrical interest which is very evident in Barking, Mr. W. E. Kidner, the borough electrical engineer, mentions, in his report for the year ended March 31st last, that there was an attendance of about 400 on each evening when cookery demonstrations were held at the Dawson and Dorothy Barley Schools. Further, it is estimated that 54,000 people visited the electricity showrooms during the period under review, the transactions numbering 19,120, and amounting in value to £17,000. The installation section has been busy, the income from ordinary work being £7,176, against £5,375 in the previous year. Additional domestic appliances (cookers, kettles and wash-boilers) hired out numbered 264, bringing the total to 776. Following a 24.8 per cent. increase in the total kWh sold in 1934-35 there was another substantial improvement (19 per cent), making the amount 16,767,343 kWh. The largest increase was in power supplies, which rose by 1,269,756 kWh, due to additional large consumers. At the end of the year under review consumers numbered 14,985 (+803).

Berwick (Northumberland).—ACQUISITION OF UNDERTAKING.—A settlement has not yet been reached between the Town Council and the Scottish Southern Electric Supply Co., Ltd., regarding the latter's proposal to take over the local undertaking of the Urban Electric Supply Co. The sale cannot be completed without the Council's consent, which would be conditional upon the deletion of the condition regarding the installation of an electric cooker before the charge of ¾d. a kWh operates on the domestic two-part tariff, the substitution of the existing small-power rate for the proposed motive-power rate, the reduction of the maximum flat rate of 7d. per kWh and the prepayment rate of 8d., and the maintenance by the company of street-lighting cables.

Bexhill.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £2,300.

Bolton.—FINANCIAL DATA.—The annual accounts of the Electricity Department (electrical engineer and manager, Mr. H. E. Annett) for 1935-36 show that the inclusive cost per kWh sold was 0.852d., against 0.924d. in the previous year, the average price obtained being 0.95d. (1d.). An analysis of the 0.95d. is as follows: Private lighting, 3.44d.; combined lighting, heating and power, 1.28d.; public lighting, 1.26d.; power, 0.66d.; traction, 0.77d. Sales increased by 11,963,753 kWh (16 per cent.) to 86,840,511 kWh, and the number of consumers rose from 29,510 to 32,776, with total connections of 128,849 kW (117,729 kW). Revenue is shown as £346,208 (£316,928) and expenses £273,905 (£183,861), giving a gross profit of £72,303 (£133,067). After deducting interest charges,



The General Electric Co.'s display at the Cinematograph Exhibitors' Association Exhibition (see page 949)

&c., the net surplus was £32,669 (£13,876). At first sight the reduction in gross surplus seems incompatible with the net balance; this is accounted for by the fact that last year an inclusive amount was paid to the C.E.B. for electricity, making it impossible to obtain a true comparison of the detailed figures.

SIMPLE HIRE SCHEME FOR ELECTRIC GRILLERS.—A scheme for the simple hire of electric grillers has been introduced by the Electricity Committee.

Burnley.—EXTENSIONS.—Approval has been given by the Rural District Council to the Nelson Corporation supplying electricity to Barley-with-Wheatley Booth, Goldshaw Booth, Old Laund Booth, and Roughlee Booth.

Burton-on-Trent.—SUPPLY TO NEWBOROUGH.—Mains are to be extended by the Electricity Committee to Newborough at a cost of £2,500.

Bury.—A SUCCESSFUL YEAR.—It was reported to the Town Council that the electricity sales during the past year amounted to 30,829,706 kWh, compared with 31,814,670 kWh for the previous year. During the whole of the period under review a large works using approximately 15 per cent. of the total output of the undertaking was closed down, but the figures show that while the undertaking lost an important consumer the normal load increased, so that the net reduction in output amounted to something less than two per cent. A new industry has recently been established on the border of the borough, and, after negotiations, the company has decided to take a supply from the Corporation. It is anticipated that this consumer will have a maximum load of 500 kW and use up to one million kWh per annum. The total number of consumers connected during the year was 1,354, a record for the Department.

Bury St. Edmund's.—DIFFICULT PERIOD PASSED.—In a general statement on the position of the electricity undertaking Mr. A. E. Knights, the borough electrical engineer, observes that the effect of the year's trading up to March 31st last indicates that the anxious period of the past three or four years is over and that prospects for the future appear to be good. The net reduction of 0.145d. in the capital cost per kWh sold points to the fact that the growth of the undertaking has justified the extra expenditure on mains reorganisation and the change-over. During the year there was an increase of 17.15 per cent., to 3,156,857 kWh, in sales, the domestic expansion being particularly satisfactory. The number of consumers at March 31st last was 3,069, against 2,868 a year before.

Caernarvon.—LOWER CHARGES.—Having considered the accounts of the electricity undertaking for the past year, revealing a profit of £1,045, the Electricity Committee has resolved that the present charges for power shall be reduced as follows: Industrial power, first 2,000 kWh per quarter, 2d. per kWh; next 1,000 kWh per quarter, 1½d. per kWh; thereafter, 1d. per kWh. Water heating and cooking, ¾d. per kWh. These charges are to be effective as from April 1st last.

Chester.—SUPPLY IMPROVEMENTS.—The Electricity Committee is to improve the supply in the Sandy Lane district at a cost of £1,967; it is also to erect a sub-station at a cost of £805 to supply the new works of the Rustproof Metal Co., Ltd., Saltney.

Clitheroe.—METERS.—Application is being made by the Electricity Committee for sanction to borrow £2,000 for meters.

SPECIAL CHARGES.—For chip-potato ranges the Electricity Committee has decided that electricity shall be charged for at 0.75d. per kWh, plus 15 per cent., and for industrial water heating, tubular heating, vehicle-battery charging, &c. (off peak) at 1d., plus 15 per cent.

Cromer.—SUB-STATION PROPOSAL.—The Urban District Council has accorded the East Anglian Electric Supply Company permission to erect a sub-station in Mill Road.

Croydon.—ELECTRIC KITCHEN PREFERRED.—During the course of the remodelling of the kitchen at Mayday Hospital electrical apparatus is to be installed by the Health Committee in lieu of gas in view of its cleanliness.

Deal and Sandwich.—LOWER CHARGES.—The South-East Kent Electric Power Co., Ltd., has reduced the "unit" charge on the business and domestic two-part tariffs from 1d. to ¾d., and the quarterly charge per 100 W of installed lighting capacity under the business two-part tariff from 7s. 6d. to 6s. 3d.

Eston (Yorks).—LOANS.—Sanction to borrow £5,980 for mains, £1,306 for sub-station equipment and £2,000 for services has been obtained by the Electricity Committee.

Exeter.—LOWER CHARGES.—Various reductions in charges, including meter rents, from 1s. 6d. to 9d. a quarter have been made by the Electricity Committee. On the "all-in" tariff the ½d. per kWh charge comes into force after 100 kWh has been used at ¾d. instead of 250 kWh; off-peak heating is reduced from ¾d. to ½d. per kWh, and combined heating and power from 1¼d. to 1¼d.

Gateshead.—NEW CABLES.—The North-Eastern Electric Supply Co., Ltd., is to lay underground cables in Church Road, Low Fell, Gateshead.

Hawarden.—EXTENSIONS.—Approval has been given by the Rural District Council to a programme of new works, including an extension to Shotton and Higher Shotton (£1,925), low-voltage switchgear in sub-stations (£770), low-voltage feeder cable at Shotton (£550), and additional transformers (£370).

Hornsey.—LATEST DEVELOPMENTS.—Mr. F. C. Orchard, the borough electrical engineer, informs us that approval has been given to a scheme of seven-year hire-purchase of certain cookers and refrigerators. The undertaking in recent months has shown a rapid advance not only from the point of view of sales of domestic apparatus but also in the output from the works. The Special Committee on street lighting has reported after consideration of experimental installations of electricity and gas, that it is satisfied that the electrical installation is by far the more efficient. The capital cost of the electrical installation will be £24,600 as compared with the capital cost of £10,650 for the gas installation; on the other hand, the annual cost of electricity supply and maintenance would be £7,867 as compared with £10,132 for gas. The Committee is therefore satisfied that the installation of electricity will, in the long run, be much less costly than gas. Furthermore, if at any time it was found essential to increase the intensity of illumination, this could be done much more cheaply by the aid of electricity than with the use of gas. It was, therefore, decided that all roads should be changed over to elec-

tricity in accordance with the British Standard Specification for street lighting.

Hungerford.—OVERHEAD EXTENSIONS.—Plans submitted by the Wessex Electricity Co. for the erection of overhead high-voltage cables in the Kintbury, Inkpen, and West Woodhay districts have been approved by the Rural District Council.

Italy.—EAST AFRICAN HYDRO-ELECTRIC DEVELOPMENT.—Signor Mussolini is reported to have approved the constitution of a national consortium embracing the principal electrical engineering concerns in Italy to interest itself in new Italian electrical undertakings, and particularly the development of the hydro-electric resources of Italian East Africa.

Kent.—ELECTRICITY FOR AN INSTITUTION.—The Public Assistance Committee has decided to expend £600 on the installation of electricity at the Malling Institution, with an additional £200 for electrical cooking equipment.

King's Lynn.—STREET LIGHTING.—The electrical engineer has reported to the Electricity Committee that he has inspected the street-lighting system at Harrogate, and recommends a system of lighting by electric-discharge lamps for London Road at an estimated cost of £500. The Committee is to investigate the matter further.

Kirkcaldy.—WIRING COUNCIL HOUSES.—A scheme for the wiring of houses for electricity has been put forward by the Town Council.

Lancashire.—FURTHER PRICE REDUCTIONS.—Following the lowering of the lighting flat rate charges last year, the Lancashire Electric Power Co., Ltd., now announces reductions involving a concession of several thousands of pounds to other classes of consumers. The fixed charge under the alternative non-residential tariff has been reduced to 1s. 4d. per 33 W installed, and the first step in the "unit" charge from 1½d. to 1¼d. It is estimated that 90 per cent. of the consumers under the combined lighting, heating, cooking and domestic rate will benefit by the elimination of the ¾d. per kWh step. Now, after the prescribed amount of electricity at 1d. per kWh has been taken, the charge is ½d. per kWh. Combined kitchens and sculleries are to be charged at half-rate if the floor area is less than 72 sq. ft., the quantity of electricity to be taken at 1d. per kWh being reduced from 30 to 15 kWh. For the benefit particularly of shopkeepers who require electricity to augment other heating methods, a reduction of ¼d. per kWh on the first 250 kWh per quarter is made in the heating, cooking and domestic power rate "D." The reduction of industrial power charges for a consumption of over 500 kWh per quarter should encourage the use of the electric drive.

Leeds.—A SUCCESSFUL YEAR.—A feature of the working of the undertaking during the year ended March 31st, 1936, was that, in spite of a decrease in the number of consumers taking local power and bulk supplies, and on the lighting and heating tariffs, in each of these three groups there was an increase in the amount of electricity sold. There was a large increase (25½ per cent.) in the number of consumers on the two-part tariff, bringing about a similar increase in the consumption of electricity, although the capacity of the apparatus was only 16½ per cent. greater. The total sales of the undertaking amounted to 295,432,919 kWh, an increase of 3 per cent.; omitting that used for traction, street lighting and bulk supplies outside the area, the output is equivalent to a consumption of 386 kWh per head, an increase of 47 kWh, based on population figures of 487,200 and 486,250 respectively. The total length of mains now laid is 2,622 miles, 101 miles being laid during the past year. Mr. C. Nelson Hefford, the city electrical engineer, also states that contracts have now been placed for two additional boilers and one 30,000-kW turbo-alternator and condensing plant.

London.—BATTERSEA.—The Electricity Committee is to change over the supply in the Nine Elms area to a.c. at a cost of £3,756.

FULHAM.—Saturday, September 26th has been fixed by the Electricity Committee for the opening of the new Fulham power station.

ISLINGTON.—A scheme has been prepared by the Electricity Committee for the further development of extra-high-voltage transmission at a cost of £80,250.

Lowestoft.—LOAN.—The Town Council has received sanction to a loan of £6,940 for mains and plant.

Newcastle-on-Tyne.—SUB-STATIONS.—Two sub-stations are to be built at The Close by the Newcastle and District Electric Lighting Co.

Portsmouth.—SUB-STATIONS.—The Town Council has received sanction to a loan of £2,000 for electricity sub-stations at Gosport.

Scarborough.—FLOODLIGHTING.—An estimate of £459 for floodlighting the castle and walls has been approved by the Electricity Committee.

Skipton.—CHEAPER ELECTRICITY.—The following concessions have been decided upon by the Urban District Council: Street lighting, from 1d. to ½d. per kWh; industrial power, maximum demand, from ¾d. to ½d. per kWh; tradesmen's lighting, maximum demand, from 3d. to 2d. per kWh; flat rate, ordinary consumers, from 5½d. to 5d. per kWh; flat rate, prepayment consumers, from 6½d. to 6d. per kWh; churches, chapels, district hospital, Town Hall and Public Library, from 3d. to 2d. per kWh.

Southend-on-Sea.—HIRING SCHEME EXTENSION.—Application has been made by the Town Council for sanction to loans of £35,000 for electrical apparatus and £15,000 for wiring installations under the hiring scheme.

Stoke-on-Trent.—REDUCED CHARGES.—The following reduced charges for electricity have been recommended by the Electricity Committee: Lighting, reduced from 3¾d. to 3½d. per kWh; lighting by prepayment meter, from 4½d. to 4¼d. per kWh; long-hour lighting, commercial and industrial, from 7d. per kWh for first hour per day of maximum demanded supply and 1d. per kWh in excess, to 6d. and 1d.; theatres and picture palaces, general lighting, a reduction of ¼d. per kWh. Two new rates are those for heating and cooking by prepayment

400-W "Osira" lighting along a picturesque Wigan thoroughfare

meter—recommended to be 1½d. per kWh when taken on a separate circuit and metered independently—and for public clocks—1¼d. per kWh where the clocks are lighted from sunset to sunrise.

Watford.—HEATING PLANT.—The Herts County Council is to install new electricity and heating plant at the Victoria House Institution, Watford, at a cost of £1,000.

Williton (Somerset).—ELECTRICITY FOR PUBLIC LIGHTING.—The Minehead Electric Supply Co., Ltd., has secured, against strong competition by the local gas undertaking, a five-year contract for supplying public lighting at Williton.

Uniformity in the West Midlands

TEN undertakings in the West Midlands District recently sent representatives to a conference called by the Joint Electricity Authority to discuss the possible standardisation of methods in the area. The district, which includes the towns of Wolverhampton, Walsall and West Bromwich, has a population of about a million.

As a result of this conference it has been possible to secure agreement upon standard methods of charge which comply generally with the recommendations of the Tariffs Committee appointed by the Electricity Commissioners.

The methods agreed upon are as follows:—

Residential supplies.—A two-part tariff consisting of a fixed charge and a small unit charge, the fixed charge to be based on either the size of house or the rateable value, at the option of the supply authority.

Business premises.—A two-part tariff consisting of a fixed charge based on the number of kilowatts of demand ascertained either by an indicator or by aggregating the number of watts installed; plus a small unit charge.

Low-voltage power supplies.—A stepped flat rate.

High-voltage supplies.—A two-part tariff consisting of a fixed charge per kVA of maximum demand, plus a small unit charge.

The Conference under its terms of reference is to standardise forms of agreement.

It has also been decided that there shall be no service charge for 40 ft. (minimum) of overhead span or 20 ft. of underground cable. A wiring testing fee of 5s. is to be charged for each installation test after the first.

The conference is to remain in being and work continuously towards that object, and for the dissemination of information and the discussion of problems of common interest.

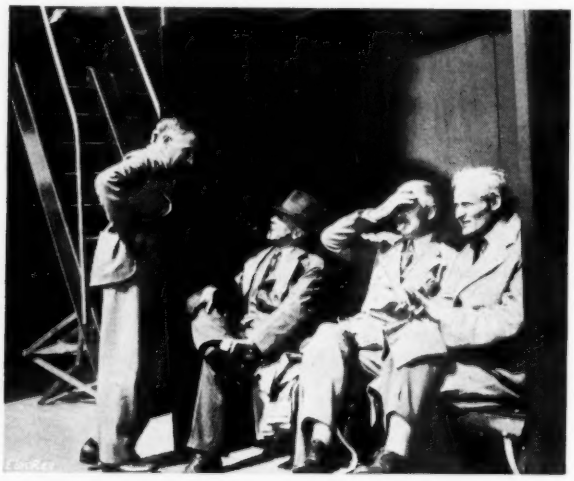
The following undertakings are represented on the conference:—The Cannock Urban District Council; the Chasetown and District Electricity Co., Ltd.; the Lichfield Corporation; the Midland Electric Corporation for Power Distribution, Ltd.; the Shrewsbury Corporation; the Trent Valley & High Peak Electricity Co., Ltd.; the Walsall Corporation; the West Bromwich Corporation; the West Midlands Joint Electricity Authority; and the Wolverhampton Corporation.

Traction

Germany.—ELECTRIC ROAD TRANSPORT.—One of the members of the management of the German State Railways, referring to the various roads which are being constructed in Germany, suggests that overhead conductors should be erected so that it would be possible for electric vehicles to transport goods at speeds as high as 75 miles per hour. It is also suggested that a combined trolley and i.c. engined lorry could be used on both main and secondary roads.

Italy.—HIGH-SPEED TRAINS.—Six streamlined articulated three-car trains for the 3,000 V d.c. lines of the Italian State Railways have been completed by the Soc. Ernesto Breda, and will shortly go into service between Bologna, Florence, Rome and Naples. They are of welded steel construction with aluminium side panels, and have seating accommodation for ninety-four passengers; a dining service is provided. The two passenger saloons are air-conditioned. Power is provided by six 200 kW traction motors. On test a speed of 106 m.p.h. was attained.

Newcastle-on-Tyne.—PROPOSED TRANSPORT BOARD.—When the Royal Commission for the Unification of Tyneside Local Authorities completed its hearing at Newcastle last week, reference was made to the suggestion made before the Commission some weeks ago that a passenger transport board should be set up for Tyneside. This board, it was suggested, should control all means of transport including railways, buses, trams and trolley-buses. A representative of the Northern General Transport Co., Ltd., one of the largest bus operators in the area, said there was no need for such a board. Modern buses provided up-to-date services all over Durham and Northumberland. When the suggestion was first made it was supported by local authorities on the grounds that it would remove anomalies in services, fares, &c.



On the I.E.E. Clyde cruise (see page 943). Our group includes Messrs. Johnstone Wright and H. Hobson, of the Central Electricity Board

Communications

Canada.—BROADCASTING DEVELOPMENTS.—It is reported from Ottawa that important administrative changes in Canadian broadcasting are provided for in legislation which was introduced in the Dominion House of Commons last week by Mr. Howe, the Minister of Marine. The present three-member Radio Commission which has controlled broadcasting since 1932 will be replaced by a new corporation modelled approximately on the British Broadcasting Corporation. There will be two salaried officials, a general manager, and an assistant general manager, and policies will be formulated by a board of nine governors receiving only nominal honoraria and appointed for one, two, or three years.—*Reuter.*

Europe.—INCREASED POWER FOR BROADCASTING STATIONS.—In last week's *Wireless World* details were published of power increases in European broadcasting stations which are likely to take place in the next year or so. Athlone will increase its power from 60 kW to 100 kW, the two Brussels stations from 15 kW each to 100 kW each. In Lithuania the 7 kW Kaunas station will be replaced by a 100-kW transmitter. In Southern Sweden a new 100-kW station will be opened. In Bulgaria, at Vakarel, there will be a new 100 kW station, and in Italy work is progressing on two new 120-kW stations at Rome. In Czechoslovakia the present Prague II station of 5 kW will be replaced by one of 60 kW. The Kosice station will be scrapped and a new 60-kW transmitter will be opened. In France two new 120-kW transmitters, one near Bordeaux and one in the centre of the country, are under construction. A giant long-wave transmitter of at least 200 kW-in-aerial has been ordered to take the place of the present 80-kW Poste National, the old Radio-Paris. The new station will be in the centre of France. In addition to these, plans for other large power increases are under discussion in Poland, Jugo-Slavia, Spain, Czechoslovakia and Estonia. Considerable development is also likely to take place on the short waves.

France.—RADIO PICTURE TELEGRAPHY.—A radio picture telegraphy service has recently been inaugurated between France and French Somaliland.

North-East England.—REPLACING TELEPHONE LINES.—Work is nearing completion on the replacement of overhead telephone lines between Durham and Berwick by underground cables. The section between Durham and Newcastle was completed some time ago, and last week the second section between Newcastle and Alnwick was finished. This part has cost £41,000. Preliminary work on the last stage of the change-over from Alnwick to Berwick has now been started.

Spain.—SUPPRESSING RADIO INTERFERENCE.—The new regulations concerning the suppression of radio interference have come into operation. The most interesting portion is that which defines what shall be considered "interference." This provides that the noise must be at least equivalent to one millivolt metre, modulated to 80 per cent. at a frequency of 800 cycles, and continue for more than 3 seconds. Disturbances of shorter duration may also be considered as interference if they are greater in intensity than this value and if they are repeated at intervals of less than ten minutes. All machines which might give rise to interference must be provided with suppressors. Exception is made of switches for lighting connections, domestic heating appliances controlled by thermostat and for certain other classes of apparatus provided that permission is first obtained in each particular case from the authority whose duty it is to apply the regulations. Fines ranging from 25 to 100 pesetas for first offence and from 100 to 500 pesetas for second offence can be imposed.

Diesel-electric Rail Coaches for Ceylon

TWO months ago the Crown Agents for the Colonies placed an order with the English Electric Co., Ltd., for three four-coach 5 ft. 6 in. gauge Diesel-electric train units, for the Ceylon Government Railways. These are primarily intended for use on the Colombo Fort-Galle-Matara sections, though it is possible that they may also be used at times on the Colombo Fort-Peradeniya section, on which route the maximum altitude is 1,750 ft. and the maximum gradient is 1 in 45.

The train unit consists of four articulated coaches of streamlined design, the passenger accommodation being made up of seventeen first-class, forty-two second-class, and 255 third-class seats. "Dunlopillo" cushions and squabs are used throughout; fans, drop windows, and lift-up louvres are provided, and there is lavatory accommodation for each of the three classes. An air space of 2¼ in. is provided between the inner and outer ceilings.

The two end coaches of each train unit are identical and interchangeable, each incorporating a driver's cab, engine, luggage and passenger compartments. It is possible to remove one of the trailer coaches. The overall length of the four-coach train over buffers is 206 ft. 6 in. and the width 10 ft. The underframe is a fabricated structure of the plate-girder type, and the body framing is integral with it. The two outer bogies are of the standard traction type, each carrying two nose-suspended traction motors driving the axles through gear and pinion drive.

There are two power units to each train, each consisting of an "English Electric" 6H (6-cylinder) engine, developing 180 h.p. at 1,350 r.p.m. under normal conditions. The engine and generator are rigidly coupled together, the exciter being overhung from the generator. These form a self-contained unit which is arranged for three-point suspension, so as to eliminate any distortion due to flexing of the underframe of the coach. Each power unit supplies two traction motors mounted on the power bogie underneath the engine compartment.

Two four-coach trains can be operated in multiple unit, for a simultaneous control of up to four power units at a time. All the engines may be started or stopped from any one driver's cab by press-button control. Each engine is provided with a motor-driven priming pump for the lubricating oil, and when the button in the driver's cab is depressed this pump is set in motion and runs until the lubricating oil pressure is built up, when the engine is started up automatically from its own battery. Pilot lights are provided in each driver's cab, and automatic safety devices to prevent overheating are incorporated.

It is stated that the new train units will be capable of doing the journey between Colombo Fort and Galle in 2 hours 17 minutes, stopping at four intermediate stations, subject to a maximum speed limit of 45 m.p.h., and including a 10 per cent. margin in time for make up in emergency. The journey between Galle and Matara stopping at all stations will be done in 1 hour 7¼ minutes, subject to a maximum speed limit of 35 m.p.h., and again including a 10 per cent. margin.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Argyll.—County Council. Electric lighting and heating installations at Kirn Public school. County architect, Dunoon (deposit £1 1s.), by June 30th.

Barking.—June 30th. Electricity Department. One portable oil purifying set. (June 19th.)

Barnstaple.—July 13th. Corporation. Two 450-kW Diesel-driven alternators and accessories for the Castle Street power station. (June 12th.)

Beckenham.—June 29th. Borough Council. Coal for the generating station. (June 12th.)

Bexhill.—July 7th. Electricity Committee. Collection, conversion and re-installation of d.c. wireless apparatus. (See this issue.)

Bexley.—July 3rd. U.D.C. Cables for one year. (June 19th.)

Bradford.—July 8th. Corporation. Two 6,600-V reactors. (See this issue.)

Bristol.—July 14th. Electricity Department. Two steam-raising units. (June 12th.)

Coseley.—June 30th. U.D.C. Electrical wiring of seventy houses on the Princes End site. J. C. Roper, clerk to the Council, Council House.

Cumberland.—County Education Committee. Electric lighting at Bassenthwaite and Blennerhasset Council schools and Burnfoot House and Burnfoot Cottage, Wigton. J. Forster, County architect, 4, Alfred Street North, Carlisle.

Dalbeattie.—June 29th. Town Council. Electrical work at housing scheme. M. Purdon Smith, 95, Irish Street, Dumfries.

Dagenham.—June 29th. U.D.C. Electrical installations at the new Town Hall. (June 19th.)

Dartford.—June 29th. Borough Council. Street lighting columns and lanterns, time switches and cases and brackets and lanterns. (June 12th.)

Denbighshire.—July 17th. County Council. Electric lighting, fittings and bells at the administration block and casual wards of the Wrexham Institution. G. D. Wiles, County architect, Acton Hall, Wrexham (deposit £2 2s.).

Egypt.—August 18th. Ministry of the Interior. 400-kW electric generating set with foundations, accessories and spares at the Zagazig power station. (T.Y. 30321.)*

Essex.—July 6th. County Council Public Health and Housing Committee. Electrical installations at the Black Notley Sanatorium extensions. (June 12th.)

July 20th. Public Assistance Committee. Electrical installation at Suttons Institution, Hornchurch. (See this issue.)

Exeter.—July 8th. Electricity undertaking. Transformers. (See this issue.)

Gravesend.—July 4th. Education Committee. Repairs, redecorations and electric lighting at Denton school. J. G. Bennett, borough architect, 5, Woodville Terrace.

Hastings.—July 9th. Electricity Department. One 3,000-kVA Scott-connected transformer with automatic on-load tap-changing equipment and protective gear. (See this issue.)

Hull.—July 21st. Electricity Committee. Generator set and testing load control board. (See this issue.)

India.—SIMLA.—July 16th. Stores Department. Electrically driven facing and re-turning machine and spares for the G.I.P. Railway. (T. 30313.)*

Kirkcaldy.—June 27th. Town Council. Electrical work at Invertiel housing estate. Borough surveyor.

Lichfield.—July 4th. Electricity Department. One 6-panel e.h.v. draw-out truck cubicle type switchboard and e.h.v. overhead line material. (June 19th.)

London.—STOKE NEWINGTON.—July 1st. Borough Council. Rising mains in the Coronation Avenue and Imperial Avenue flats. (June 12th.)

ST. PANCRAS.—July 9th. Electricity Department. P.i., l.c. cables, prepayment meters, meter boards and cooking stoves, fires, wash-boilers and water-heaters for twelve months commencing August 1st next. (June 12th.)

CORPORATION OF TRINITY HOUSE.—July 13th. Alterations to existing buildings, dismantling of existing plant, and the installation of new engines and other machinery for fog signal and electric lighting at St. Ann's Lighthouse, Dale, Haverfordwest. J. M. Nicolle, secretary, Trinity House, Tower Hill, E.C.3.

KENSINGTON.—June 28th. Borough Council. Vehicle-actuated traffic signals at four junctions. Borough engineer, Town Hall, W.8.

SOUTHWARK.—July 1st. Borough Council. Internal communication telephone system for the Municipal Buildings, Walworth Road. (June 19th.)

BETHNAL GREEN.—July 6th. Borough Council. Domestic electric cookers. (See this issue.)

COMMISSIONERS OF WORKS.—July 9th. Electric wiring at the British Museum, N.W. Quadrant. (See this issue.)

Manchester.—July 11th. Assize Courts and Judges' Lodgings Committee. Electric lighting fittings at the Civil and Crown Courts and other rooms at the Courts. D. D. Boliver, steward, Assize Courts.

July 7th. Electricity Committee. One 200-kW rectifier equipment. (See this issue.)

New Zealand.—WELLINGTON.—August 11th. Public Works Tender Board. Seven 110-kV oil-immersed circuit-breakers. (T.Y. 30302.)*

Northern Ireland.—BELFAST.—July 11th. Harbour Commissioners. Two electrically operated gantry cranes for the Queen's Quay. T. N. Burke, superintendent of cranes, Harbour Office.

Plymouth.—July 6th. Electricity Department. E.h.v. and l.v. cables. (See this issue.)

Portsmouth.—July 3rd. Electricity Undertaking. Two 100-kW rectifier sets. (June 12th.)

Roxburgh.—District Mental Hospital Joint Committee. Electrical work at cottages at the Mental Hospital, Melrose. J. and J. Hall, architects, Galashiels.

Sheffield.—July 13th. Electricity Committee. 450-kVA and 300-kVA transformers and 500-kVA Scott-connected sets. (See this issue.)

July 4th. Electric lighting installation at a school. A. Rayner, 161, Cross Hill, Ecclesfield.

South Africa.—CAPE TOWN.—July 15th. Electricity Department. One l.v., a.c., iron-clad switchboard. (T.Y. 30310.)*

PRETORIA.—July 17th. Union Tender & Supplies Board. Frequency meters and dial testers. (T. 30336.)*

Public Works Department. July 24th. Air-conditioning plant at the Hillbrow telephone exchange, Johannesburg. (T. 30358.)*

July 31st. Air-conditioning plant at the Elsenberg School of Agriculture Insectary, Stellenbosch. (T. 30359.)*

August 7th. Air-conditioning plant at the Springs telephone exchange, Johannesburg. (T. 30357.)*

CHRISTIANA.—July 22nd. Municipality. Power station plant and distribution network. (T.Y. 30368.)*

JOHANNESBURG.—July 30th. City Council. L.v. switchgear. (T.Y. 30340.)*

CAPE PROVINCE.—July 27th. Ceres Municipality. Power-station plant and conversion of overhead network from d.c. to a.c. (T.Y. 30367.)*

Southampton.—June 30th. Electricity Department. Transformer kiosk, 6,600-V and 660-V switchgear and 6,600-V reactors. (June 19th.)

Stockton-on-Tees.—Town Council. Electric lighting fittings at the Newtown schools. T. Downey, town clerk.

Swansea.—July 1st. Borough Council. 150-W horizontal-mounting sodium vapour lamps, lanterns and electrical equipment. (June 19th.)

Tiverton.—July 8th. Town Council. 3¾ miles of e.h.v. overhead and underground lines. (See this issue.)

Walton and Weybridge.—July 8th. U.D.C. Electricity Department. E.h.v. cable, transformer kiosk, e.h.v. pedestal type switchgear and ring-main controllers, transformers and l.v. feeder pillars. (See this issue.)

Watford.—July 8th. Corporation. E.h.v. and l.v. p.i. cables from July 1st next to June 30th, 1937. (See this issue.)

West Riding.—June 29th. County Council. Electric lighting at Pontefract Girls' High school and electric lighting and heating at Selby School of Art. Education Officer, County Hall, Wakefield.

Yorkshire.—July 6th. Electric lighting installation at a school. C. Ellison, Education Office, Rock House, Swinton.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Barnes.—Town Council. Accepted. H.v. pilot and feeder cables (£1,978).—Siemens Bros.

Chester.—Electricity Committee. Accepted. Switchgear (£280).—Met.-Vick. Elecl. Co. Switch pillar (£33).—B.I. Cables, Ltd.

Chislehurst and Sidcup.—U.D.C. Accepted. Electric lighting in forty-seven houses (£210).—W. M. Williamson, Petts Wood.

Chiswick and Ealing.—Hospitals Committee. Electrical installation at Hospital extension:

	£		£
Mead & Jeffery, Ltd., Accepted ...	**698**	A. C. Baker	800
Honor Bros.	708	Harris & Gubbins	911
Holliday, Hall & Stinson	728	Ross & Robinson, Ltd.	993
Caine Pernot, Ltd.	731	Watson & May	1,077
Page & Girling	746	Young Radio & Elec. Engg. Co.	1,088
F. H. Wheeler & Co.	794		

Coatbridge.—Town Council. Accepted. Electrical work at the public baths and swimming pond (£676) and at the public health offices and clinic (£353).—E. J. Stiell & Co.

East Preston.—West Sussex C.C. Accepted. Wiring at Institution (£175).—Page & Miles, Ltd.

Eston.—Electricity Committee. Accepted. H.v. cable (£247).—B.I. Cables, Ltd. L.v. cable (£334).—Siemens Bros.

Hornsey.—Borough Council. Accepted. Plant for two new sub-stations at St. James's Mews and Colney Hatch Lane: Switchgear (£1,335).—A. Reyrolle & Co. Transformers.—Bruce Peebles & Co.; Hackbridge Electric Construction Co. L.v. distribution boards (£176).—English Electric Co. Control gear (£731).—G.E.C.

Kirkcaldy.—Town Council. Accepted. L.v. and h.v. cables, boxes, &c. (£14,353).—Henley's.

London.—FULHAM.—Electricity and Lighting Committee. Recommended. Workshop tools for the new power station.—Reynolds & Wilson (£1,814); C. M. Hill (£1,339). Electric furnace, pulveriser, crucible and apparatus for coal analysis at the power station (£240).—Baird & Tatlock, Ltd.

Accepted. Eight 200-kVA transformer equipments complete with 8-way l.v. unit (£2,463), two 100-kVA transformers (£216) and accessories (£48) in connection with the alteration of the distribution system; and sixteen transformer panels (£248) and eighty distributor panels (£810) for the re-equipment of sub-stations.—W. Lucy & Co.

HACKNEY.—Electricity Committee. Recommended. Distribution switchgear for sub-stations (£4,000).—B.T.H. Electric vehicles for the sales and distribution sections: Two 1-ton vehicles (£674).—Morrison's. One 7-8 cwt. vehicle (£268).—Electricars, Ltd.

ISLINGTON.—Electricity Committee. Recommended. Steel lamp columns for twelve months (£20 each).—W. Lucy & Co. Fire protection apparatus.—Walter Kidde & Co. (£1,176); Foamite Firefoam, Ltd. (£2,420). Emergency lighting battery:

	£		£
Britannia Batteries, Ltd....	{327 466	D.P. Battery Co.	379
Edison Swan Electric Co.... ...	356	Fuller Accumulator Co. (1926), Ltd.	419
Alton Battery Co.	360	Batteries, Ltd.	527
***Chloride Electrical Storage Co., Recommended**	**379**	Alklum Storage Batteries, Ltd....	548
Hart Accumulator Co.	379	T. A. Edison	809
Tudor Accumulator Co.	379	* Distribution and change-over panel £108 extra.	

L.C.C.—Wiring and fittings for electric lighting, &c., in blocks 1 (part), 2, 3 and 4 (part) of dwellings on the Waterloo House site, Bethnal Green:

	£		£
R. C. Cutting & Co. Accepted...	**2,235**	Evans and Shee	2,569
Pemberton and Sturgess (Great Britain)	2,287	Carr Bros.	2,618
Bell Bros. & Co. (London) ...	2,292	G. E. Taylor & Co.	2,982
Archibald Meckhonik	2,551	Davis Myer & Co.	3,110
		Arthur Cozens	3,120

Electric bed lift in block B of the Constance Road Institution, East Dulwich:

	£		£
Evans Lifts, Ltd. Accepted ...	**798**	Marryat and Scott, Ltd. ...	990
Pickerings, Ltd.	835	Express Lift Co.	1,010
Waygood-Otis, Ltd.	910		

STEPNEY.—Electricity Supply Committee. Recommended. Supplies during the year ending June 30th, 1937: Tubing and fittings (£626), shades (£288), and lampholders (£85).—Wholesale Fittings Co. Ceiling roses (£87).—Falk, Stadelmann & Co. Joint boxes (£277).—W. White & Co. Switch fuses.—Wholesale Fittings Co. (£149); P. L. Dwyer & Co. (£324). Public lighting columns (£97).—Bromford Tube Co. Pump to be used in connection with the fuel-washing apparatus at the Limehouse generating station (£235).—W. H. Allen, Sons & Co.

Housing Committee. Accepted. Electrical installations on the Branch Road site.—Francis Polden & Co.

HAMMERSMITH.—Electricity Committee. Recommended. Two 1,000-kVA oil-insulated, self-cooled transformers for the new Elms House site sub-station, Hammersmith Road (£432 each).—G.E.C. Prepayment meters for one year.—Measurement, Ltd. Application of short-circuit tests to certain of the Council's single-phase h.v. switchgear (£400).—A. Reyrolle & Co. Meter boards for one year from April 1st last (in lieu of previous tender).—Caxton Wood Turnery, Ltd.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Electric discharge lamps and gear in connection with the lighting improvements in York Road (£8 6s. 3d. each).—G.E.C. Additional equipment at the Arlington Road sub-station consisting of a four-panel 600-A open-type distribution board and three single-pole 1,200-A isolating switches (£343).—A. Reyrolle & Co. Five-way switchboard comprising one stationary sheet steel cubicle and four fuse units with double isolators for extension of the Highgate sub-station (£310).—English Electric Co. Transformers during the ensuing twelve months.—British Electric Transformer Co. (1,000-kVA at £470 each); Fuller Electrical and Mfg. Co. (750-kVA at £392 each); G.E.C. (500-kVA at £187 each).

Luton.—Town Council. Accepted. Electric water heater for the Town Hall (£204).—Archibald Low Electrics, Ltd.

Middlesex.—County Council. Health Committee. Recommended. Electrical installation at West Middlesex County Hospital (£382).—Read & Partners, Ltd.

Reading.—Town Council. Accepted. Rectifier equipment, &c., at the Transport Depôt power station (£3,205).—Hewittic Electric Co.

Richmond (YORKSHIRE).—Town Council. Accepted. Two 350-kW transformers at the main sub-station (£826).—Johnson & Phillips, Ltd.

Stoke-on-Trent.—Housing Committee. Recommended. Wiring for electric lighting and fittings at seventy-six houses on the Cornhill No. 2 site (£454).—Edstan Electric.

Public Works Committee. Recommended. Supply of electrical goods.—Robinson & Hands Electrical Co.

Swindon.—Town Council. Accepted. Underground h.v. cables.—Standard Telephones. E.h.v. light metal-clad switchgear, l.v. open-type distributing switchboard, and two outdoor transformers.—Ferguson, Pailin, Ltd.

Warrington.—Health Committee. Accepted. Installation of electrical apparatus at Grange Sanatorium.—Meta, Ltd.; at Aitken Hospital.—H. Bibby & Co.

Electricity Committee. Accepted. Transformers.—Electric Construction Co. Turbine discs and overhaul of turbine, two oil filters and accessories.—Brush Elecl. Engg. Co.

Watford.—Hertfordshire C.C. Accepted. Lift electrification at Shrodells Institution (£292).—W. Wadsworth & Sons.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, July 2nd. Natural History Museum, London, S.W.7. Annual conversazione. Wednesday, July 15th. Institution, London, W.C.2. Conversazione and reunion of members from overseas.

South Midland Centre.—Tuesday, June 30th. Summer meeting. Visits to the works of the British Thomson-Houston Co., Rugby, and the Shakespeare Memorial Theatre, Stratford-on-Avon.

Transmission Section.—Friday, July 17th, to Monday, July 20th. Visit to France, including trips to Creney, near Troyes, and to St. Denis.

Association of Mining Electrical Engineers.—Tuesday, June 30th, to Friday, July 3rd. Russell Hotel, London, W.C.1. Annual convention.

Royal Sanitary Institute Health Congress.—Monday, July 6th, to Saturday, July 11th. Southport.

Diesel Engine Users' Association.—Wednesday, July 8th. Loughborough. Summer meeting.

Electrical Contractors' Association.—Wednesday, July 8th, to Friday, July 10th. Folkestone. Annual conference.

Notes

The I.E.E. Hampshire Sub-Centre

Members of the Hampshire Sub-Centre of the Institution of Electrical Engineers held their summer meeting on June 18th. In the morning visits were paid to the Portsmouth electricity undertaking, where the members were entertained by the chairman of the Electricity Committee; to the 132,000-V Wymering sub-station of the Central Electricity Board, and then to the sewage disposal works at Cosham. Inclement weather somewhat curtailed the outdoor part of the programme. The party lunched at the Dolphin Hotel, Chichester, and then went to Messrs. Shippam's potted meat factory and an 11,000-V sub-station of the Chichester undertaking. Later the members were shown the paintings and furniture in Goodwood House. Tea was taken at the Waterbeach Inn at the invitation of the Mayor of Chichester, who was accompanied by the Mayoress, Councillor Herneman, and Mr. R. V. Weare, the Chichester engineer. The party then proceeded to the arboretum of the West Dean Estate.

The I.E.E. Overseas Conversazione

As we have already reported, the Conversazione of Overseas Members of the Institution of Electrical Engineers is to be held on July 15th at the Institution Building. There will be a reception by the President and Council at 8.30 p.m. and at 9 p.m. the President will give a short address on "The Organisation of Manufacture, Development and Research in relation to the Electric Supply Industry." This will be followed by an address on "Television—an Outline," by Dr. E. Mallett. The reunion will commence at 9.30 p.m.

Heating Engineer's Summer Meeting

The annual summer meeting of the Institution of Heating and Ventilating Engineers was held at Margate from June 22nd to 24th. Following the business meeting and mayoral welcome, a paper was read by Mr. A. F. Dufton, of the Building Research Station of the Department of Scientific and Industrial Research, on "Heating Research," the first part of which was historical, while the second half briefly outlined the research activities of the Institution at home and those of similar organisations abroad. The remainder of the meeting was devoted to social and recreational functions.

A Rothamsted Demonstration

In the unavoidable absence of the director, Sir E. John Russell, the assistant director, Dr. B. A. Keen, conducted a demonstration of the electrical equipment at the Rothamsted Experimental Station, Harpenden (Lawes Agricultural Trust), on Tuesday last. This farm is the oldest agricultural experimental institution in the world and the largest (over 500 acres) and most famous in the British Empire. Its soil research and investigations into plant growth, nutrition and diseases are recognised all over the world. Electricity is obtained from the North Metropolitan E.P.S. Co., while the installation and most of the electrical appliances have been provided by the General Electric Co., Ltd. On account of the investigational uses to which the equipment is put, it is necessarily somewhat more elaborate than would be needed on the average farm. The appliances are, nevertheless, quite typical of commercial designs already available in the ordinary way to farmers.

Appointments Vacant

Clerk of works for electric wiring installations for Greenwich Borough Council.

Junior charge engineers for Keighley Electricity Department.

Assistant II (civilian) in the Department of Scientific Research and Experiment, Admiralty.

Electrical engineering assistant in the drawing office of the Air Ministry.

Lady demonstrator for Heston and Isleworth Electricity Department

Lady demonstrator for Cheltenham electricity undertaking.

Deputy borough electrical engineer for Ilford.

Showroom attendant for Horsham Electricity Department.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

ALBION glue pot heater.
RANTON lampholder (bakelite).
THEXOR iron.
BLEIDON small armature rewinding machine.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

The Honours List.—The King's Birthday Honours List, which was published on Tuesday last, contains few names of electrical interest. Among those directly or indirectly connected with the electrical industry were the following:—**Mr. H. N. Gresley,** C.B.E., D.Sc., M.Inst.C.E. M.I.Mech.E., M.I.E.E., chief mechanical engineer, London and North Eastern Railway, upon whom a knighthood has been conferred. The M.B.E. (Civil Division) has been awarded to **Mr. J. H. Small,** Director of Telegraph Services, Department of Posts and Telegraphs, Newfoundland; **Mr. R. M. Taylor,** assistant engineer (Telegraph Engineering and Wireless Service), in charge of Bombay Sub-Division; **Mr. M. R. Ry Achariyar,** A.C.G.I., M.I.E.E., A.A.I.E.E., executive engineer, Electricity Department, Madras; **Mr. L. Harvey,** engineer-in-charge, Manchester Station, British Broadcasting Corporation; and **Mr. C. Land,** superintendent, higher grade, Central Telegraph Office, G.P.O. **Lt. D. A. Williamson,** Tyne Electrical Engineers, R.E., Territorial Army, becomes an M.B.E. (Military Division), and **Mr. J. P. Yorke,** M.Sc., A.M.I.E.E., Principal, London County Council School of Engineering and Navigation, Poplar, receives the O.B.E. (Civil Division). A knighthood has been conferred on **Mr. R. Chinoy,** Director of the Indian Radio & Cable Communications Co., Bombay.

Mr. L. A. S. Robbons has resigned from the Simplex Electric Co., Ltd., and has now returned to Archibald Low Electrics, Ltd., as their representative for London and the South England at their new London offices.

Mr. V. M. Jensen, superintendent of the Newcastle-upon-Tyne branch of the Great Northern Telegraph Co., Ltd. (of Denmark), is retiring after thirty-six years' service with the company. He has been at Newcastle since 1929 and on June 17th he was presented by the members of the branch with a silver coffee service.

Mr. V. M. Jensen

Mr. C. Hetherington Tinker, of the staff of the General Electric Co., Ltd., Manchester, who was married on June 13th to Miss A. E. Harrison, has been presented by his colleagues with a standard lamp and a radio set.

Mr. J. S. McCulloch has been appointed assistant electrical engineer in the Electricity Department of the Stewartry of Kirkcudbright County Council. Mr. McCulloch is at present on the staff of the Galloway Water Power Co., and was previously for ten years with Messrs. Merz and McLellan in London and Newcastle.

Mr. G. T. Garwood, B.Sc., the author of the article on "A Power-Energy Meter," on page 933, received his early training with the Colchester Corporation and, after a period of war service, served with the Plymouth and Kingston-on-Thames Corporations. He subsequently joined Mr. G. V. Twiss, M.I.E.E., as assistant in his consulting business, and collaborated in the preparation of a number of schemes for rural electrification, subsequently taking up the position of resident engineer in charge of all construction for the then newly formed Electricity Distribution of North Wales and District, Ltd.

On the completion of this work he was appointed to the position he now holds of engineer and manager to the West Hampshire Electricity Co., Ltd., as well as the Ringwood Electricity Supply Co., Ltd. Mr. Garwood took his engineering degree at London University and became an associate member of the I.E.E. in 1926.

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Mr. G. T. Garwood

Dr. Earle Page, Deputy Premier of Australia, amongst the plating vats during his visit to the Strowger Works of the Automatic Electric Co., Ltd., Liverpool, on June 17th. With him are (right) Mr. T. E. L. Lescher, chairman, Liverpool Chamber of Commerce, and Mr. F. C. Burstall, director and manager of the company

It was announced in the newspaper Press on Friday last that **Mr. J. C. Denison-Pender** had tendered his resignation of the post of chairman and managing director of Cable & Wireless, Ltd., to which he was appointed in April, 1932, following the resignation of Sir Basil Blackett. It was also stated that a successor had been named and that the approval of the Government would shortly be given. Certain of the Press reports referred to differences between the directors, and said that another member of the board of the operating company might also resign, but Mr. Denison-Pender informs us that there is no difference of opinion on the board and never has been. The directors, he adds, have unanimously agreed to his suggestions of reorganisation of the management of the Communications Company (Cable & Wireless, Ltd.), which will be made public shortly. As readers of the REVIEW are aware, Mr. Denison-Pender is a son of the late Sir J. Denison-Pender and a grandson of Sir John Pender, the pioneer of many submarine telegraph undertakings. Reports have appeared in the Press to the effect that **Mr. E. Wilshaw,** a managing director of the company, is being appointed chairman and sole managing director.

[Elliott & Fry

Mr. J. C. Denison-Pender

Mr. Gordon Bancroft, a director of Messrs. John Chew & Co., electrical factors, Blackburn, and a director in charge of an associate company, Messrs. G. H. Wright, Ltd., Chester, was married on June 17th to Miss Doris Whittaker, of Basford.

Mr. F. C. Orchard, the borough electrical engineer of Hornsey, has been given an increase in salary of £100 a year as from June 1st.

Mr. B. L. Wells, deputy engineer and manager of the Heston and Isleworth electricity undertaking, has been appointed deputy electrical engineer to the Hammersmith Borough Council.

At the annual general meeting of the English Electric (Stafford Works) Engineering Society on June 16th, **Mr. G. H. Nelson,** chairman and managing director of the company, was appointed president. Other appointments were as follows:—Vice-Presidents: Messrs. W. E. Milton-Ayres and F. Wallis; committee: Messrs. R. B. Besley, P. A. Hawley, G. W. Graham, L. B. Mallalieu, F. L. Smith, E. J. Warner and L. B. Wood; hon. treasurer: Mr. K. Love; and hon. secretary: Mr. H. Stanier.

Mr. Alfred Clark, chairman of Electric & Musical Industries, has just undergone a serious operation.

Mr. L. Burbridge

Mr. L. Burbridge has been appointed London manager of Messrs. Blackstone & Co., Ltd., and will have a fully qualified technical staff under his control at the new offices, Imperial House, Kingsway, London, W.C.2. He received his training in London as an engineer, and has in recent years been concerned chiefly with the sale of British oil engines in the American market.

The Bexhill-on-Sea Electricity Committee has reported to the Council that the borough electrical engineer, **Mr. C. A. Frost**, contemplates resigning on account of ill-health, and it recommends that advertisements be issued for a successor.

Obituary

Mr. H. R. Burstall.—The death of Mr. H. R. J. Burstall, M.Inst.C.E., at the age of 73, is reported in *The Times*. He was apprenticed to a marine engineering business in London, subsequently gaining a Whitworth Scholarship at the Birkbeck College. He was also a student at University College, London, under the late Sir Alexander Kennedy. He eventually took up consulting work and was a partner in the firm of Burstall & Monkhouse.

Mr. T. G. H. Broad, of Swanscombe, secretary of the North-East Kent Division of the Electrical Trades Union, and also of the Gravesend Branch, died on June 16th. He was proprietor of the wireless and electrical business of Broad Bros., Swanscombe, and was formerly an electrician at the Empire Paper Mills, Greenhithe. He was a member and former chairman of Swanscombe Urban Council.

Monsieur A. Boucher.—The death recently occurred in Switzerland, at the age of eighty, of Monsieur Anthelme Boucher, a well-known French engineer and a pioneer of hydro-electric development in the French and Swiss Alps, particularly in relation to the utilisation of high heads and storage reservoirs. Up to 1900 a head of 1,640 ft. had been considered as the maximum permissible, but in 1901-2 a plant was established at Vouvry under his direction to work under a head of over 3,000 ft.

Mr. Edgar Hesketh, engineer and manager of the Alderley Edge and Wilmslow Electricity Board, died on June 14th at Folkestone, where he had been for the benefit of his health, at the age of sixty-one years. He became engineer and manager when the undertaking belonged to the Edmundson group, and he retained the position when the Electricity Board took over control in 1928. He was apprenticed to Messrs. Fowler and Co., Leeds, was later an assistant engineer at the Blackpool electricity works, and had been engineer and manager at Lymington and Cromer.

Mr. T. W. Lockyer.—We learn with regret of the death of Mr. T. W. Lockyer, for many years a director of the Thames Board Mills, Ltd. The funeral service took place at Purfleet on Wednesday last.

Mr. William Fawcett Osborn, chairman of Messrs. Samuel Osborn & Co., Ltd., steel manufacturers, died at his residence, Snaithing Grange, Sheffield, on June 16th. He was seventy-five years of age.

Mr. R. L. Boyd.—The death occurred on June 19th, at Hastings, of Mr. Robert Langley Boyd, retired commander, Eastern Telegraph Co.

Mrs. Pickvance.—We regret to record the death, which occurred on June 17th, at Colwyn Bay, of Mrs. Pickvance, wife of Mr. William G. Pickvance, representative for the Weston Electrical Instrument Co. in Manchester and North-West District, and formerly borough electrical engineer of Wrexham.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

London General Supply Co., Ltd.—Private company. Registered June 17th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in dynamos, motors, armatures, magnetos, batteries, vacuum cleaners, hairdryers, refrigerators, wireless sets, gramophones, and other electrical machinery, &c. The directors are: Maurice De Meyer, 27, Winsford Terrace, Edmonton, N.18; and two others.—Secretary: A. H. Jarmain. Registered office: 3, Stanton House, 7, High Road, Wood Green, N.22.

Improved Products Co., Ltd.—Private company. Registered June 17th. Capital, £3,500. Objects: To acquire the businesses carried on by H. Thomas at Craven House, Kingsway, W.C.2, as Alba Lamp Co., Guardian Electrical Co., and the Improved Products Co., and to carry on the business of manufacturers and retailers of and dealers in electrical incandescent lamps of all descriptions, stands, frames, plugs, holders, shades, switches, glassware, &c. The directors are: H. Thomas, 162, Foxley Lane, Purley, merchant; H. C. Tennant, "Holmwood," Lake View, Canons Park, Edgware, merchant; and D. B. Taylor, 3, Lincoln's Inn Fields, W.C.2. Registered office: Craven House, Kingsway, W.C.2.

Economic Merchandise, Ltd.—Private company. Registered June 17th. Capital, £1,000. Objects: To carry on business as agents and/or sub-agents for the importation, exportation and purchase and sale of electric light globes, general electrical sundries, radio sets, &c. The permanent directors are: A. E. Denne (chairman), Pine Cottage, Little Kingshill, Gt. Missenden, Bucks; and R. S. Thomas, The Pines, Chorley Wood, Herts. Registered office: 20, Frogmoor, High Wycombe, Bucks.

Victor Buckland, Ltd.—Private company. Registered June 17th. Capital, £3,000. Objects: To acquire the business of an electrical engineer and radio dealer carried on by V. Buckland at 16/18, Howe Street, Derby. The permanent directors are: Victor Buckland and Mrs. Gertrude Buckland, both of 16/18, Howe Street, Derby. Registered office: 16/18, Howe Street, Derby.

Truvox Engineering Co., Ltd.—Private company. Registered June 17th. Capital, £6,000. Objects: To acquire the goodwill, trade marks (including the trade mark "Truvox") and other assets (except book debts) of the business heretofore carried on by Universal Gramophone and Radio Co., Ltd. (now in voluntary liquidation), and to carry on the business of manufacturers of and dealers in electro-acoustical, acoustical and sound-producing articles, &c. The subscribers are: L. A. Stewart and Wm. F. W. Ram, both of 18, Austin Friars, E.C.2. Solicitor: Slaughter & May, 18, Austin Friars, E.C.2.

F. V. Collins & Co., Ltd.—Private company. Registered June 20th. Capital, £2,000. Objects: To acquire the business carried on by F. V. Collins and L. F. Mayersbach at 155, Kingston Road, Wimbledon; and to carry on the business of electrical engineers, wireless and gramophone dealers, &c. The directors are: F. V. Collins, 10, Rosehill Road, West Sutton, Surrey; and L. F. Mayersbach, 67, Cavendish Avenue, New Malden, Surrey. Secretary: L. F. Mayersbach. Registered office: 155, Kingston Road, Wimbledon, S.W.

National Clock Manufacturing Co., Ltd.—Private company. Registered June 19th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electric and other types of clocks, &c. The subscribers are: E. A. Moss, 38, Dunstan Road, Golders Green, N.W.11; and J. Wolfson, 71, Chalkhill Road, Wembley Park, Mdx. E. A. Moss signs document as managing director.

Concealed Heating Co., Ltd.—Public company. Registered June 18th. Nominal capital, £30,000. Objects: To acquire from the inventors and patentees a system of electrical heating for buildings (Patent No. 407924) covering the rights for Great Britain, Northern Ireland and the Isle of Man, to adopt an agreement with J. H. Taylor and others, and to carry on the business of heating engineers, electrical contractors, &c. The directors are: J. H. Taylor (chairman), Moorcroft, 15, Queen's Road, Huddersfield, and three others.

Returns of Electrical Companies

Heath Electrical and Gramophone Co., Ltd.—L. J. Goss, accountant, 39, Constantine Road, Hampstead, N.W.3, was appointed receiver and manager on June 11th, under powers contained in debentures dated June 29th, 1935.

St. Austell and District Electric Lighting and Power Co., Ltd.—Satisfaction to the extent of £20,000 on June 10th of debenture dated December 31st, 1925, and registered January 4th, 1926.

Particulars filed of £16,000 debentures, authorised May 12th, 1936, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Llanidloes Electric Light Co. (1926), Ltd.—Particulars filed of £2,000 debentures authorised June 5th, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,900.

A. J. Shrosbery & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1935 (filed May 22nd, 1936). 170 shares taken up. £170 paid. Mortgages and charges at date of return, £100; since registered: debenture dated February 15th, 1936, to secure £300.

Macfarlane Electrical Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1935 (filed April 17th, 1936). All shares taken up. £3,000 paid. Mortgages and charges, nil.

Electrical and Auto Products (1931), Ltd.—Capital, £2,000 in 1,000 shares of £1 and 20,000 shares of 1s. each. Return dated December 31st, 1935 (filed May 1st, 1936). 954 £1 and 20,000 1s. shares taken up. £1,954 paid. Mortgages and charges, £1,000.

Gibrico Electric, Ltd.—Capital, £1,000 in £1 shares. Return dated May 14th, 1935 (filed April 18th, 1936). 800 shares taken up. £400 paid. £400 considered as paid. Mortgages and charges, nil.

Nulite Fittings, Ltd.—A. L. Price, 8, Exchange Street, Manchester, ceased to act as receiver on May 21st.

City Notes

Telephone Rentals, Ltd., held its annual meeting on June 18th. Mr. F. T. Jackson, chairman and managing director, who presided, stated that the titles of the British subsidiary companies had been changed to "Telephone Rentals," with geographical designations indicating the respective areas of operation. The comprehensive private telephone services offered by the company had given such satisfaction that the directors had decided to extend the range of apparatus offered on rental to electrical instruments which would simplify factory control and production, also electric publicity clocks, all of which apparatus was marketed under the name of "Chronomatic Service." During the first five months of the year progress had been maintained. The subsidiary companies were all in a sound financial position. The Australian Government had recently imposed a higher import duty and a licensing system which would, he thought, be of considerable benefit to the Australian business.

Hall Telephone Accessories (1928), Ltd., in its interim report, states that, in order to deal with the increased work now available on an efficient basis, further extensions to plant and machinery and factory accommodation will have to be undertaken. It is proposed that these additions shall be put in hand at once. To enable the company to finance this programme without reducing unduly its liquid resources, it is proposed to offer immediately to shareholders new shares in the proportion of one new ordinary share for each five shares held at 5s. premium a share (that is, at 15s. per share). Output so far during 1936 has shown a satisfactory increase, and the results for the first part of this year and the prospects for the remainder are such as to justify the directors in maintaining the interim dividend at 5 per cent.

The Globe Telegraph & Trust Co., Ltd., reports that the net revenue for the year ended May 31st amounted to £195,449, as compared with £193,734 for 1934-35. To this is added £116,644 brought in, making a total of £312,093. Three interim dividends of 1s. 6d. per share, free of tax, on the ordinary shares and three interim dividends of 3s. per share, less tax, on the preference shares, have been paid, and a final dividend of 4s. 6d. a share, free of tax, on the ordinary shares, and 3s. a share, free of tax, on the preference shares, will be paid on July 1st. A balance of £121,769 is carried forward. The offer of Cable & Wireless (Holding), Ltd., to repay at par a portion of the 5½ per cent. preference stock was accepted to the extent of approximately one-third of the trust's holding, and the money has been re-invested.

The Lisbon Electric Tramways, Ltd., reports that, after deducting interest charges in connection with the Companhia Carris de Ferro de Lisbon and the payment of £21,320 interest on and redemption of the debentures of this company, there is a net profit of £157,255, a decrease of £15,777 as compared with 1934. After transferring £65,000 (against £70,000) to general and depreciation reserve and providing for preference and interim ordinary dividends, the directors propose to pay a final dividend of 4½ per cent. on the ordinary shares, making 7½ per cent. for the year (same). A balance of £47.628 (against £52,234) is carried forward. During the year 121,810,659 passengers were carried, an increase of 1,276,338.

John Ismay & Sons, Ltd., report a trading profit last year of £39,418, an increase of £5,338, as compared with the previous year. To this was added £8,615 (against £2,970) profit on sale of shares, making £48,033. After placing £1,000 to reserve against interests in subsidiary companies and £3,703 (£3,185) to depreciation, there was a net profit of £43,329 (£33,864). After providing for preference dividends and reserving £3,000 for income tax, the directors recommend a final dividend of 45 per cent. (against 27½ per cent.) on the ordinary shares, leaving £6,263 (£5,934) to be carried forward.

Richardsons Westgarth & Co., Ltd., report a smaller trading loss for 1935—£17,053—as against £21,664 in 1934. After adding interest charges, &c., the deficiency is increased to £26,550, which compares with a credit of £507 for the preceding year. The directors point out that the work executed during 1935 was booked mainly at a time when prices were at their lowest level and orders were very difficult to obtain. Recent orders include a very large condensing plant for the London Power Co., Ltd.

S. Smith & Sons (Motor Accessories), Ltd., in order to provide the necessary finance for the development of the aircraft instrument and clock branches of the business, propose to offer 50,000 £1 seven per cent. non-cumulative preferred ordinary shares and 280,000 1s. deferred ordinary shares to shareholders in the proportion of one preferred ordinary at 50s. for every six held and one deferred ordinary at 5s. for every six held. The new shares will participate in the final dividends for the current financial year.

The Electric Construction Co., Ltd., held its annual meeting on June 23rd, when Mr. J. Gray (chairman and managing director), who presided, said that stock-in-trade and work in progress again showed a satisfactory increase, and the volume of unexecuted orders was also greater. Export trade had shown some improvement since last year, but care was still necessary to obviate the locking up of capital abroad in consequence of import licences and exchange restrictions.

The Vera Cruz Electric Light, Power & Traction Co., Ltd., reports operating revenues in 1935 of 603,811 Mexican pesos (against 569,245 pesos). Expenditure, including taxes, increased from 540,708 pesos to 627,753 pesos, leaving a deficit of 23,942 pesos (against a profit of 28,537 pesos). Sales of electricity increased by 440,000 kWh to 9,995,000 kWh.

Callender's Cable & Construction Co., Ltd., reports a profit for the year ended December 31st last of £405,950, as compared with £290,230 in the preceding year, and after providing for depreciation of buildings, plant and machinery, &c., debenture interest, &c., there is a balance of £252,450, which with £306,372 brought in, makes £558,821 available. The ordinary dividend for the year is maintained at 15 per cent. and £390,234 is carried forward. The report states that the company's export trade to India, Australia and South Africa has improved and the outlook in these directions is encouraging. The profits of the Anchor Cable Co., Ltd., have also shown a substantial increase on the preceding year. The preference and ordinary shares are to be converted into preference and ordinary stock. Meeting: July 1st.

Increases of Capital.—The nominal capital of the following companies has been increased by the addition of the undermentioned amounts, the registered capital being given in parentheses:—Electrical Facilities, Ltd., £150,000 (£200,000); Neon (Portsmouth), Ltd., £2,000 (£1,000); H. C. Trondahl, Ltd., £4,000 (£1,000); Alliance Wholesale, Ltd., £7,000 (£3,000); Oliver Pell Control, Ltd., £23,604 (£106,396); Pye Radio, Ltd., £20,000 (£180,000); Horley and District Electricity Supply Co., Ltd., £150,000 (£50,000); Chesham Electric Light and Power Co., Ltd., £25,000 (£200,000); Slough and Datchet Electric Supply Co., Ltd., holds a large number of the issued shares of the three last-mentioned companies.

The James Keith & Blackman Co., Ltd., reports an increase in gross profits from £108,751 to £122,460 for the year ended March 31st. After providing for expenses and income tax, depreciation, &c., there was a net profit of £30,588 (£23,916), plus £10,559 brought in. It is proposed to pay 15 per cent. (against 12½) on the ordinary shares, and to carry forward £10,160.

The Musselburgh & District Electric Light & Traction Co., Ltd., reports net receipts last year of £16,421 (against £16,405). A sum of £5,000 is placed to reserve, and it is proposed to pay a dividend of 2 per cent. on the ordinary shares (against nil), carrying forward £1,813 (£1,227). The company's capital reorganisation scheme received the sanction of the Court on February 7th.

The Kalgoorlie Electric Tramways, Ltd., reports an increase in gross receipts for 1935 from £28,566 to £29,072. The net profit of £2,493 (£1,856) has been transferred to the sinking fund for the redemption of "B" debenture stock. A further 2 per cent. on account of capital of "B" debenture stock was made on July 8th, 1935.

Berry's Electric (1928), Ltd., report a trading profit for the year ended March 31st last of £26,444, as compared with £24,581 in the preceding year, to which is added £600 brought in. The dividend for the year is 5 per cent. (against 2½ per cent.), and £3,039 is carried forward.

W. & T. Avery, Ltd., have declared a final ordinary dividend of 10 per cent., making 15 per cent. for the year. The dividend for the previous year was the same, but a capital bonus of 20 per cent. was also distributed.

Greenwood & Batley, Ltd., have announced an ordinary dividend for the year of 4½ per cent. (against 4 per cent. for 1934-35).

Thomas de la Rue & Co., Ltd., propose to increase their dividend from 5 to 6½ per cent. for the year ended March 28th last.

Stocks and Shares

TUESDAY EVENING.

INTERNATIONAL politics are beginning to assume a little less unsettled appearance, and the result is visible already in several of the Stock Exchange markets. The dropping of sanctions is deemed to be a factor that should make for peace. The bold policy of the new French Minister of Finance has aroused favourable, if somewhat cautious, comment. The distribution of the soldiers' money in the United States is thought likely to be a means for quickening the wheels of American industry and trade. At home, companies are issuing annual reports and profit statements that, in the majority of cases, show improvement upon those of twelve months ago. Here and there disappointment occurs. It is, for example, both unexpected and regrettable to find in the latest index-figure of Cable and Wireless, a sharp decline from that of the previous month. Business in most of the markets is moderately active, although the disposition of the moment is rather to seek specialised shares than for investment and speculation to be spread over a wide area of securities.

Electricity Supply Shares

Business in the electricity supply market is practically at a standstill. The best that can be said of the market is that sellers are equally as scarce as buyers. The Southern Areas new shares have proved very popular; another large turnover during the week raised the premium by 9d. to 2s. 9d. over the issue price of 21s. Apart from a small improvement in British Power and Light, to 31s. 6d., and minor recessions in Hendons, at 54s., London Electrics, at 39s., and Electrical Finance and Securities, at 3 1/16, the Home share-price list is not quotably altered.

Elsewhere, Palestine "A" shares and Jerusalem ordinary remain depressed by the long-drawn-out disturbances in the country. Atlas Trusts have put on a few pence to 5s. 9d. Whitehall preference were lowered further to 21s. Perak Hydros are a good market at 26s., and Tokyo 6 per cent. bonds gained 2 points to 83½.

Shares on Offer

Following the recent publication of particulars relating to Electrical Switchgear and Associated Manufacturers, Ltd., the placing of a block of the company's 5 per cent. preference shares gives the investor an opportunity to acquire a good line at about 20s. 9d. Profits at the rate of £31,900 per annum for the six months to January last, compare with £22,500 for the whole of 1935, and £2,800 in 1934. These figures are eloquent of the progressive nature of the company's business. Payment of the £5,000 required for the annual preference dividend is, as can be seen, well covered by earnings. The yield works out at £4 16s. 5d. per cent.

Cable and Wireless

Mention has been made of the disappointment felt with the index figure published by Cable and Wireless, the market effect of which was to bring about reaction in the prices of the stocks. Previously they had been in a good deal of demand, the preference, which was standing below par three or four weeks back, advancing to 103¾, and the junior stocks also receiving a certain amount of attention. Upon publication of the index figure, the preference fell back to 102, the "A" stock being 10s. down at 21½.

Lively interest was aroused by the rearrangement of the board. Curiosity is rife as to the reasons which have dictated this step. In some quarters, the changes are taken to be a prelude to a rearrangement of the company's capital. The new chairman has a high reputation for administration capacity. The board—as reconstituted—is expected to investigate closely the possibilities for extension of traffic on the one hand, and, on the other, of introducing further economies into the working. It may be that until the awaited scheme for reorganising the capital is laid before shareholders for their consideration, no particular improvement can be looked for in the value of the stocks, though obviously if the index number were to give signs of a definite advance, prospective purchasers would not wait for any lead other than this. There are many people on the look-out for the opportunity to take an interest in the stocks, as soon as the way looks to be open for definite recovery.

Manufacturing and Equipment

The damping effect of the world's troubles has, for many weeks, robbed the industrial share markets of much of their fire. That the embers are, however, still very much alive is shown by the fact that a good industrial report seldom fails to blow a spark into lively flame. The electrical equipment market is seldom without its points of active interest. For the last week or two the General Electric report and dividend have kept the company's shares in the centre of the stage, while Callenders, for the same reason, and the mercurial Cromptons, have also played their parts. It has been the turn of Henleys to monopolise a good deal of attention during the past week. Persistent buying, based on good current trading reports and encouraged by the impressive Callenders' results, forced up the price of Henley's from 7 to 7 7/16. The figures in Callender's report, good as they are, fulfil previous expectation, and the price of the shares, at 4 3/16 ex dividend, shows no change. The yield from the seventeenth successive dividend of 15 per cent. is a modest 3.6 per cent. With trading profits running some £120,000 higher than in the year 1934-35 the door seems open, however, for a bonus distribution sooner or later.

Price Movements

Cromptons puzzled the market by the vivacity of fluctuations that dropped the price to 70s. and rallied it to 75s. General Electrics, ex dividend and rights, show a net gain of 1s. 6d. at 79s. ex all. The premium on the new shares has risen to 19s. 3d. Lancashire Dynamos are changing hands around 49s.: the official quotation has not yet been altered from its previous 46s. 3d. Telephone Rentals gained a few pence at 10s. as a result of the annual meeting. Hall Telephones stiffened to 20s. 6d. ex dividend. Telephone Manufacturing are slightly easier at 9s. 9d. ex rights: the premium on the new shares is now half-a-crown. London Electric Wires are harder at 30s. 9d. Telegraph Condensers at 36s. 3d. and Reyrolles at 73s. have both eased off.

Miscellaneous Matters

Hopkinsons, at 38s. 9d., are in good demand on the idea that the company is continuing to benefit from Central Electricity Board development schemes. Tube Investments jumped 5s. to 70s. and Pressed Steels 1/6 to 24s. 9d. Babcock and Wilcox made a recovery of 2s. 3d. to 48s. 9d. British Aluminiums receded 6d. further to 38s. 6d. by reason of the company's labour troubles. Electrical and Musical Industries hardened to 25s. 6d. E. K. Coles are 28s. 6d. Pye deferred dropped 1s. to 11s. 6d., ex rights. Broadcast Relay Services remain heavy at 7s. 6d.; the report will not be issued until the Government's policy on the question of wireless relay exchanges is known.

With transatlantic markets quietly steady, Western Unions and International "Tel. and Tel." gained further ground, the former rising 3¾ points to 87⅛ and the latter a point to 14¼. Brazilian Tractions went ahead to 12⅞ and Hydro Electrics to 7⅛. Rubber shares begin to show signs of recapturing public interest, the statistical position of the industry becoming more favourable with every month.

Share List of Electrical Compan

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. Previous.	Dividend. Last.	Price. June 23.	Rise or Fall.	Yie p.c £ s.
Bournemouth and Poole	1	15	15	77/6	—	3 17
City of London	1	7½	7½	37/–	—	4 1
Clyde Valley	1	7	8	45/–	—	3 11
County of London	1	10½	10½	56/–	—	3 15
Edmundson's 7% Pref.	1	7	7	35/-xd.	–3d.	4 0
Do. Ord.	1	8	8	43/–	—	3 14
Elec. Dis. Yorkshire	1	9	9	48/6	—	3 14 3
Elec. Fin. and Securities	1	12½	12½	3 1/8	—1/8	3 15
Elec. Supply Corporation	1	11	11	62/–	—	3 11
Lancs Light and Power	1	7½	7½	38/6	—	3 18
Lond. Assoc. Electric	1	—	7	35/–	—	4 0
London Electric	1	7	8	39/–	–1/–	4 2 1
London Power Deb. Red.	Stock	5	5	108½	—	4 12
Metropolitan	1	10	10	51/6	—	3 17 7
Midland Counties	1	7	7½	41/–	—	3 13
Mid. Elec. Power	1	8	8	43/9	—	3 13
North Eastern Electric Ordinary	1	6	6	34/–	—	3 10 7
Do. 7% Pref.	1	7	7	35/6	+6d.	3 19 9
Northampton	1	10	10	53/9	—	3 14 5
Notting Hill 6% Pref.	10	6	6	14½	–½	4 4 3
North Met. Elec. Ordinary	1	10	10	58/9	—	3 8 0
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 0
Scottish Power	1	8	8	43/–	—	3 14 5
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–	–6d.	7 2 10
Yorkshire Elec.	1	8	8	45/6	—	3 10 4

PUBLIC BOARDS.

Central Electricity, 1950–70	Stock	5	5	118	—	4 4 9
Do. 1955–75	,,	5	5	120	—	4 3 4
Do. 1951–73	,,	4½	4½	111	+1	4 1 1
Do. 1963–93	,,	—	3½	101	—	3 9 4
London Elec. Trans. Gtd.	,,	—	2½	96½	—	2 11 10
London & Home Counties, 1955–75	,,	4½	4½	115	+2	3 18 3
London Passenger Transport, A	,,	—	4½	123½xd.	—	3 13 0
Do. do. B	,,	—	5	127xd.	—	3 18 9
Do. do. C	,,	3½	4	102	—	3 18 5
West Midlands Joint Elec. 1948–68	,,	—	5	116½	—	4 5 10

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	167½	—	5 7 6
Anglo-Am. Tel. Pref.	Stock	6	6	127½	+1	4 14 0
Do. Def.	,,	1½	1½	30	—	5 0 0
Cable & Wireless 5½% Pref.	,,	4½	5½	102	–1	5 7 10
Do. A. 7½% Ord.	,,	Nil	Nil	21½	–⅛	—
Do. B. Ord.	,,	Nil	Nil	7	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14½	–½	3 3 2
Do. do. Pref.	10	6	6	14½	+½	4 4 3
Great Northern Tel.	10	20	20	44½	—	4 10 0
Marconi-Marine	1	10	7½	31/3	–9d.	4 16 0
Oriental Telephone Ord.	1	12*	12*	3½	—	3 13 10

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	1450	—	—
Do. do. Pref. Ord.	,,	8	8	177½	—	4 10 2
Brazil Traction	100	—	30 cts.	12⅞	+⅛	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 17 7
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	50	—	—
Victoria Falls Ord.	1	20	20	76/3xd.	+6d.	—
West Riding	1	5	6½	51/3	—	2 10 9

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	61/3xd.	–9d.	4 18 0
Assoc. Elec. Ord.	1	6	8	48/–	+6d.	3 6 8
Do. Pref.	1	8	8	38/6	—	4 3 1
Babcock & Wilcox	1	8	8	48/9	+2/3	3 5 8
British Aluminium Ord.	1	7½	7½	38/6	–6d.	3 18 0
British Insulated Ord.	1	15	20	5½	—	3 16 2
Brush Ord.	Stock	Nil	Nil	42½	—	—
Callender's	1	15	15	4 1/16xd.	—	3 11 8
Do. 6½% Pref.	1	6½	6½	32/6xd.	+6d.	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	75/–	+½	0 16 8
Do. 8% Pref.	1	8	8	2 ..	—	4 0 0
Edison Swan 1st Pref.	1	7½	7½	30/–	—	5 0 0
Electric Construction	1	3½	7	1½	—	4 0 0
Enfield Cable Ord.	1	25	25	5½	—	4 15 3
English Electric	1	Nil	Nil	21/–	—	—
Do. do. Pref.	1	Nil	Nil	25/3	—	—
Ericsson Tel.	5/–	24	20*	2½	—	2 4 6
Ever Ready	5/–	35	35	26/3	—	6 13 4
Ferranti Pref.	1	7	7	27/6xd.	–9d.	5 1 10
G.E.C. Pref.	1	6½	6½	33/–	+1/–	3 18 9
Do. Ord.	1	10	15	79/–xd.	+1/6	3 16 0
Henleys	1	30	30	7⅞	+⅛	4 1 4
Do. 4½% Pref.	5	4½	4½	5⅞	—	3 18 3
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	7½	10	46/3	—	4 6 6
Lancashire Dynamo	1	5	10	2⅛	—	4 6 6
Siemens Ord.	1	4	6	28/9	—	4 3 6
Telegraph Construction	£1	Nil	Nil	26/3	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered ent agents. The numbers in parentheses are those under hich the specifications will be printed and abridged and all subsequent proceedings will be taken.

1934

24517. "Dry batteries." F. MacCallum and A. H. Redfern. ugust 25th, 1934. (Cognate application 12086/35.) (447974.)
29654. "Means for converting electrical energy into sound." . G. A. H. Voigt. October 17th, 1934. (447749.)
30069. "Sliding contacts for use with electrical resistances." A. Prestidge and W. T. Webster (trading as A. Prestidge & Co.). October 20th, 1934. (447902.)
30183. "Loud speakers." E. K. Cole, Ltd., and A. E. Falkus. October 22nd, 1934. (447750.)
30745. "Manufacture of electrodes for electrolytic processes." B. Laporte, Ltd., and I. E. Weber. October 26th, 1934. (447827.)
30817. "Insulated electrical conductors." A. D. Blumlein and H. E. Holman. October 26th, 1934. (447754.)
30819. "Television and like cathode-ray tube oscillograph arrangements." Marconi's Wireless Telegraph Co., Ltd., H. M. Dowsett and R. Cadzow. October 26th, 1934. (447828.)
33242. "Methods of starting alternating-current motors." British Thomson-Houston Co., Ltd. November 18th, 1933. (447755.)
33247. "Galvanic cell, particularly an electrical accumulator." Accumulatoren-Fabrik Akt.-Ges. November 18th, 1933. (Cognate application 33248/34.) (447757.)
33263. "Telephony." Staat der Nederlanden. November 29th, 1933. (447758.)
33393. "Electromagnetic switching arrangements for use in electric welding machines." New Process Welders, Ltd., and F. C. Hohs. November 20th, 1934. (447760.)
33413. "Coupling devices for use with electric conduit installations." V. T. Montrose. November 20th, 1934. (447762.)
33752. "Automatic switches for use in telephone or like systems." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. November 23rd, 1934. (447767.)
33843. "Electrolytic etching machines." British Insulated Cables, Ltd., S. D. Syndicate, Ltd., E. G. Hartel, F. J. Brislee and R. Blackburn. November 24th, 1934. (447909.)
34010. "Echo sounding apparatus." Marconi International Marine Communication Co., Ltd., and N. P. Hinton. November 26th, 1934. (447838.)
34066. "Microphones." Siemens Bros. & Co., Ltd., and G. W. Sutton. November 27th, 1934. (447777.)
34094. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., W. J. Scott and C. E. Fenwick. November 27th, 1934. (447919.)
34141. "Leakage current actuated apparatus particularly applicable to neutral conductors subject to voltage fluctuation." A. G. Bullen. November 28th, 1934. (447979.)
34222. "Alternating-current electric motors." British Thomson-Houston Co., Ltd., and A. H. Maggs. November 28th, 1934. (447984.)
35092. "Electrical contact devices for locks." G. A. Platin. December 6th, 1934. (Addition to 439137.) (Convention date not granted.) (447924.)
36077. "Cord grips for electrical appliances." Bulpitt & Sons, Ltd., and W. H. Bulpitt. December 17th, 1934. (447987.)
36222. "Burglar-alarm systems." H. J. Tibbles, H. C. Tibbles and Rely-A-Bell Burglar & Fire Alarm Co., Ltd. December 18th, 1934. (Cognate application 21289/35.) (447782.)

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1071. "Circuit arrangements for luminous electric-discharge devices." G. Tilles. January 11th, 1935. (447844.)
1680. "Bells for telephone systems." General Electric Co., Ltd., and C. C. Puckette. January 18th, 1935. (447928.)
3676. "Moving-coil loud speakers." F. H. Lee. February 5th, 1935. (447846.)
3938. "Electrically heated boilers for heating tar and tar bitumen compounds." J. Molyneux, F. Williams, H. H. Dewhurst, F. Hoon and G. S. Molyneux. February 7th, 1935. (447789.)
4500. "Electric-discharge devices." M-O Valve Co., Ltd., and E. C. S. Megaw. February 12th, 1935. (447790.)
4536. "Prepayment apparatus controlling the duration of operation of electrical apparatus." C. Battegay and Soc. Anon. des Ateliers Brillié Frères. February 12th, 1935. (447934.)
6203. "Electromagnetic releasing devices for use in automatic circuit-breakers and like electric switches." A. Sadler (Schiele & Bruchsaler Industriewerke Akt.-Ges.). February 27th, 1935. (447791.)
6276. "Vapour electric convertors." General Electric Co., Ltd., and E. Gallizia. February 27th, 1935. (447999.)
7537. "Electric-arc convertors." General Electric Co., Ltd., and W. G. Thompson. March 11th, 1935. (447851.)
8362. "Selective disconnecting boxes for electric cables." W. T. Henley's Telegraph Works Co., Ltd., and W. A. Legge. March 18th, 1935. (447794.)
9645. "Electric conductor couplings of the plug-and-socket type." C. H. Parsons, Ltd., and G. B. Handley. March 28th, 1935. (447797.)
9805. "Method of quickly stopping continuous-current motors for driving rolling mills." Schloemann Akt.-Ges. March 29th, 1934. (447853.)
12163. "Super-heterodyne receiver for wireless reception." Hazeltine Corporation. May 31st, 1934. (448005.)
12768/9 and 12770. "Electric discharge devices." British Thomson-Houston Co., Ltd. April 28th, 1934. (447946/7/8.)
13042. "Electric time-switch devices, particularly for timing X-ray photographic exposures." G. P. Dean, and T. F. Caldwell. May 1st, 1935. (447854.)
15508. "Electromagnetic sound-recording and/or reproducing machines." C. Lorenz Akt.-Ges. June 9th, 1934. (447804.)
15849. "Circuit arrangements for telephone or like instruments." General Electric Co., Ltd., and A. F. Jones. May 31st, 1935. (448011.)
16594. "Voltage-regulating devices." C. Lorenz Akt.-Ges. June 13th, 1934. (447807.)
16704. "Shades for electric-light sources." Vereinigte Lausitzer Glaswerke Akt.-Ges., and H. Lorschy. June 9th, 1934. (447808.)
24190. "Reflectors, more particularly for road-lighting." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Sept. 10th, 1934. (447864.)
25203. "Cathode-ray tubes." J. D. McGee, and L. Klatzow. Sept. 20th, 1934. (Divided out of 27120/34). (Cognate application 14428/35.) (447819.)
25448. "Railway and like signalling systems." Standard Telephones & Cables, Ltd., J. B. Griffiths and A. Brown. Sept. 13th, 1935. (447866.)
28138. "Exhausting and gas-filling machines for electric-lamp bulbs and similar receptacles." British Thomson-Houston Co., Ltd. Oct. 12th, 1934. (447957.)
29023. "Photo-electric sound pick-ups." R. G. Johnson. Oct. 23rd, 1934. (Divided out of 30391/34.) (447958.)
32337. "Thermionic amplifier and relay arrangements." Marconi's Wireless Telegraph Co., Ltd. Nov. 21st, 1934. (447879.)
34540. "Modulated carrier wave transmitters." Marconi's Wireless Telegraph Co., Ltd. Dec. 12th, 1934. (447888.)
34772. "Manufacture of insulated electrically conductive screens, more particularly for use in cathode-ray tubes. A. D. Blumlein and H. E. Holman. Oct. 26th, 1934. (Divided out of 447754.) (447824.)

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307. "Arrangements for cooling glass electric-discharge devices." British Thomson-Houston Co., Ltd. Jan. 3rd, 1935. (447967.)
7837. "Loudspeaking telephone system." T. K. Lewis and W. G. Baller. Nov. 21st, 1935. (447971.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 17th:—

Ant. No. 568467. Class 6. Electric drills.—Bergmann and Davies, 5, St. James's Place, Westminster, S.W.1.

Permaneon. No. 567372. Class 8. Electric neon signs and tubes, automatic time switches for operating electric neon signs, and transformers (not being machines) for electric neon signs and tubes.—Permalite Signs, Ltd., Penraevon Works, 170, Meanwood Road, Leeds.

Sunix. No. 567272. Class 11. Instruments, apparatus and contrivances, not medicated, for surgical or curative purposes, or in relation to the health of men or animals.—Watson & Sons (Electro-Medical), Ltd., 43-47, Parker Street, Kingsway, W.C.2.

Design only. No. 568685. Class 50. Refrigerating chests and ice safes.—Electrolux, Ltd., Oakley Road, Luton, Beds.

Fire Protection for Electrical Apparatus

THE National Fire Protection Co., Ltd., gave an interesting demonstration last week at the Richmond Fire Brigade headquarters of the use of methyl bromide for extinguishing fires connected with electrical installations. A metal-lined hut measuring 20 ft. square by 8 ft. high was prepared to represent a sub-station, and inside were placed a transformer, sundry cables and oil drums. On the floor, in trays with a total area of 120 sq. ft., was 40 gal. of transformer oil, and circulating oil was continuously pumped from outside over the transformer.

The automatic fire-extinguishing equipment installed there comprised two "Essex" No. 6 outfits (each one generating 90 cu. ft. of methyl bromide), supplying eight discharge pipes, and two fusible links operating the extinguishers, an alarm bell, light indicator and a door and vent-hole closing device. Alternative hand operation was provided both at the extinguishers and by remote wire pull. Five pieces of petrol-soaked waste, followed by further petrol introduced at five points, were used to ignite the oil. The fusible links operated when the temperature reached 110 deg. F., the methyl bromide being released by weights falling and piercing copper discs in the bottoms of the containers. From ignition to the moment when the extinguishers started to operate was 30 seconds, from the commencement of discharge to extinction 12 seconds, and from extinction to the completion of extinguisher discharge a further 12 seconds. Attempts to re-ignite the treated oil five minutes later by means of a lighted petrol-soaked rag failed.

Another demonstration showing the extinction by two hand extinguishers of 20 gal. of transformer oil in a 90-sq.-ft. tray in the open air proved that methyl bromide operates more than three times as quickly as carbon dioxide foam, the actual times being 20⅝ and 68⅝ seconds respectively. Mr. C. B. Sanders, the managing director of the company, also told us that only about one-sixth as much methyl bromide is required as carbon tetrachloride. Apart from its speed of operation, methyl bromide is especially suitable for protecting electrical apparatus, on account of its extremely high electrical resistance.

A Faraday House report states that a current of about 26 micro-ampères was registered when 22,500 V was passed through a 2½-ft. jet. This represents an impedance of 865 megohms.